INTERNATIONAL ENCYCLOPEDIA

OF

POPULATION

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EDITOR IN CHIEF

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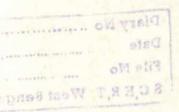
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These volumes are dedicated to

Bernard Berelson,

1912–1979

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Preface

Since 1978 a major undertaking of the Center for Population and Family Health has been the preparation, under the leadership of John Ross, of the *International Encyclopedia of Population*. Compilation of the first general summary of knowledge in a field as diverse as this one has been a complex task. The past two decades have witnessed a dramatic increase in attention to a wide range of population-related issues, in both developed and developing countries. Demographic research, population policy formation, family planning programs, contraceptive development, the aging of Western populations, and new migration patterns are only a few of the important subjects covered in this comprehensive work. It has been a challenge to cover such diversity while still maintaining a primary focus on the fundamental knowledge that must remain the backbone of substantive applications.

We have been fortunate indeed in the generous financial assistance provided by the United Nations Fund for Population Activities, the Rockefeller Foundation, the Mellon Foundation, and the Hewlett Foundation, supplemented by their valuable counsel and encouragement. Without these contributions, provided at critical points, completion of this work would hardly have been possible.

I wish to express personal appreciation to Dr. Ross and his coeditors, Regina McNamara, Jeanne Stillman, and Lynn Collins, for their extraordinary commitment to this difficult undertaking. Their efforts have resulted in an encyclopedia of unusually high quality. Thanks are also due to staff throughout the Center for Population and Family Health, who assisted in ways too numerous to count.

Fundamental credit goes to the contributors, for, no matter how varied the staff at any one center, the materials are too rich to be covered authoritatively without the involvement of specialists throughout the field. A reference work can be only as good as its authors, and these volumes are much strengthened by the exceptional response to the concept of a population encyclopedia shown by the distinguished members of the profession represented in its pages.

Allan Rosenfield
Director, Center for Population and Family Health

Foreword

An encyclopedia of population that is international in content and readership should be judged in relation to its bearing on the concern and aspirations of the people of the world. When the United Nations Fund for Population Activities provided financial assistance for the preparation of this work, we expected it would be a source of theoretical and technical knowledge for those engaged in achieving the population goals expressed by the international community. In particular, we expected that it would assist the Fund in its efforts to apply the concepts and achieve the goals of the World Population Plan of Action with regard to the interrelationships between population and development. Let me outline some of these goals and important program areas as a context for the scope of the articles contained in this encyclopedia.

It is a goal for the 1980s to enable couples and individuals in all countries to exercise the basic human right to decide freely and responsibly the number and spacing of their children, and to have the information, education, and means to do so. Research efforts should be intensified to promote the development of new contraceptive methods and the adaptation of contraceptive technology to meet the needs of developing countries.

Mortality in many parts of the developing world is still very high. Measures to reduce infant, childhood, and maternal mortality need to be intensified through such programs as the promotion of primary health care and improved nutrition.

Many developing countries feel that their current patterns of spatial distribution of population are unsatisfactory. Overpopulation in rural areas in relation to the available agricultural land as well as overcrowding in urban areas and related problems need solutions urgently. Countries that wish to develop policies on voluntary migration should be assisted so that they may bring about a balanced population distribution.

Where fertility is low and life expectancy is long, as in developed countries, questions related to manpower, labor mobility, and aging have to be faced. Thus, new programs are needed in anticipation of the social and economic consequences of the structural changes caused by these factors.

Considerable progress was made during the 1970s to improve the quality and the magnitude of demographic data required for planning and policy making in developing countries. In many countries, however, reliable population data are still seriously lack-

ing. Continuing attention will have to be paid to meet this need through improved census operations, strengthened vital statistics registration, sample surveys, and other statistical data collection systems.

It is vitally important that all the various population factors, including size, growth, fertility, mortality, migration, urbanization, age structure, and spatial distribution, continue to be perceived as variables that act upon and are acted upon by social and political conditions. In this connection, it should be noted that population growth and development patterns not only affect the demand for resources but also generate environmental changes that will have repercussions on the future carrying-capacity of the earth.

It is significant as well to recognize that population is a distinct sector within national development plans and global development strategies, including the Strategy for the Third Development Decade. At the national level, countries are becoming more and more self-reliant in policy formulation, planning, and the implementation of population programs. In order to increase national capacity to undertake various activities, it will be necessary to give increased attention to training of local staff and to facilitating the creation of population units in the ministries concerned with population and development. At both the national and international levels, efforts to improve equity, social justice, and the quality of life of mankind must continue to take into account the essential relationships that exist between population and development.

One of the most valuable lessons the Fund has learned through a decade of work in providing international population assistance is the need to ensure that the understanding of population issues and the programs of assistance reach people in their homes and in the communities in which they live. Both educational efforts and modes for delivery of service should be designed with that need in mind.

The most significant demographic trend of recent years is the decline of fertility rates, especially in developing countries. However, even assuming that fertility rates will continue to decline over the two remaining decades of this century, the world's population is projected to increase by about 1.8 billion by the year 2000. This increase in numbers will bring in its wake some unfamiliar but very real problems that need recognition and attention now to enable countries and the international community as a whole to cope in a humane and orderly manner with the implications of a nearly 50 percent increase in numbers.

If the topics in this very brief survey of population issues were placed on a list, that list could serve well as an outline of the material in this encyclopedia. It has been no doubt a difficult task to provide scholars, government officials, planners, program administrators, and interested lay persons with the tools necessary for understanding the complexity of population issues and programs while remaining within practical dimensions. The United Nations Fund for Population Activities is pleased to have participated in making this work possible. We expect it to have a long and useful life in libraries and offices throughout the world.

Rafael M. Salas
Executive Director, United Nations Fund for Population Activities,
and Under-Secretary-General, United Nations, New York

Foreword

Any science that wishes to renew itself must periodically undertake an epistemological review including a critical analysis of its methods, values, and impact. There has not been such a reexamination of demography for some time, and we must be grateful to the editors, to Columbia University, and to the publishers for providing us with this important work.

The *International Encyclopedia of Population* includes articles on all significant topics in the field. However, the term "encyclopedia" in its title should not be construed to imply the mere accumulation of knowledge. It is used here in its etymological sense, that is, referring not only to a set of discrete elements but also to how they are essentially interlinked. The making of an encyclopedia for any field of study is not simply a matter of assembling all the information within each area of the field. What is essential, if the work is to be a valuable one, is identifying the crucial points within each area, those strategically useful for research, and especially for applied research.

A guiding principle in the preparation of this encyclopedia was to interrelate the various demographic phenomena. Although the entries herein are arranged alphabetically, topics are clustered and interwoven. The quantity of knowledge in the field of population continues to expand but must not be permitted to lose its essential unity. Persistent efforts must be made to find linkages for every concept, every theory, and every datum.

Nor should collaboration be limited to different sectors of one discipline; it should spread to interaction with other disciplines as well. There are only too many works on population that are isolated from the other social sciences. At present, too many demographers have insufficient background in economics or sociology while too many economists and sociologists are not sufficiently aware of demography. It is important to compensate, by means of interdisciplinary collaboration, for the tendency toward specialization on a narrow subject. There are, of course, hazards in either excessive generalization or excessive specialization, and a path between the two must be carefully followed by every intellectual discipline.

During recent years, the study of population has been enriched by empirical data more than have many other disciplines. It has profited also from a more rigorous logical

order. Its growth has been aided by increased mathematization, which has been used as a practical tool for analysis more than as a means to achieve scientific purity. Demography has thus become one of the most structured of the social sciences. But to try to appraise fully its present and future prospects is not possible without considering it in the context of the overall development of its sister sciences. Indeed, nothing is more misleading than the notion of a solitary scientist working only from his own imagination. Mathematicians, physicists, biologists, separated by substantive or terminological boundaries and dispersed throughout the world, are nevertheless held together by the powerful and invisible links of a community of research and a body of intellectual procedure. All research builds on an existing stock of knowledge resulting from much previous inquiry. In demography as elsewhere, the problems addressed depend much upon the state of advancement of other sciences.

The issue of data collection, since it is vital to research, is given high priority in this work. It is, of course, necessary to assemble the facts, to inventory what exists before trying to understand it. It is at such a cost that demography can move further from descriptive to explanatory work. Data on births, deaths, and migration are to be taken as given raw material from which the underlying reality can be abstracted. Only that kind of process of generalization permits the causal analysis so indispensable to all scientific effort, and this analysis in turn is the source of interdisciplinary connections.

The *International Encyclopedia of Population* will attract not only the scientist in search of present knowledge and appropriate methodology; it will attract also the policy maker in search of explanation and analysis. In the debate on independence or cooperation between the scientist and the prince, we resolutely hold that inquiry must ever accompany decision. To enhance the success of the measures taken, there should be a stream of applied research, that is, research that leads to the resolution of problems. It is essential to blend scientific curiosity with political significance, detached reflection with firm implementation. In this spirit, one must applaud the decision that this work should give prominence to the problems of the Third World, where demographic issues carry the greatest urgency.

Léon Tabah
Director, Population Division, United Nations, New York

Introduction

No alphabetically arranged reference work for the population field has ever before existed, remarkable in a field with a three-hundred-year history and a radical expansion during recent decades. The two volumes of the *International Encyclopedia of Population* reflect the state of knowledge at the outset of the 1980s and emphasize well-established findings, trends, and patterns not likely to change quickly. The classic subjects of demography compose the core, with selected extensions outward to broader population topics. The first concern is basic knowledge under each subject; the second is policy and applications. Both developing country and developed country contexts are considered.

The *International Encyclopedia of Population* (*IEP*) is similar in character to the two-volume *International Encyclopedia of Statistics* (*IES*) and may be regarded as a companion work to it and to the eighteen-volume *International Encyclopedia of the Social Sciences* (*IESS*). The broadest of these three reference sources, all published by the same firm, is of course the *IESS;* both it and the *IES* may assist readers investigating topics touching in one case on the more technical statistical aspects of population and in the other case on social science features.

Given the same task, different editors would produce different, though presumably overlapping, encyclopedias. The construction of this one evolved through a series of interacting decisions governing its audience, content, boundaries, size, and authorship. In all these respects, as well as in the planned distribution of the work, we aimed to make the *IEP* as international as possible.

We decided to direct the work to a relatively broad audience, in fact to several audiences: to the academic world and to libraries, to population institutions and workers in developing countries, to action agencies concerned with population, and to a lay group of journalists and others. Thus contributors were asked to avoid excessive technicality and to stress overviews of available knowledge. The maximum level of difficulty was gauged to population professionals reading outside their own specialities, so, for example, a specialist in internal migration would find it profitable to consult the *IEP* for information on mortality or fertility.

The content of the *IEP* was developed first by reference to the major divisions of the field, such as fertility and marriage, mortality and morbidity, internal and external

migration, data and methods; then to policy and applications, as with population law or programmatic action to affect population growth; then to the field of demography itself, as with mathematical demography and historical demography, then to closely related topics such as literature resources, organizations, and geographical units. Possible article titles were developed within each such area. Our outline of contents then evolved through a series of winnowings and additions, the latter especially by reference to linkages between the major divisions. Throughout, we gave priority to the basic knowledge of the field, with systematic secondary attention to applications.

The boundaries set were of several types. An approximate size limit was fixed at the outset by publishing considerations, and although it was considerably stretched during the gestation of the work, it nevertheless guided basic decisions on the approximate number of articles and their average length. We chose neither a dictionary format, with a large number of highly specific, brief entries, nor an essay approach, with a small number of very lengthy entries. Our decision was to use articles of medium length, with topics selected at an intermediate level of generality. This in turn guided the degree of specificity used in determining the scope of each article and its internal detail.

Certain exclusions were also part of the boundaries. We decided to give little attention to historical aspects of the field, a choice that reflected our desire to devote the available space to present knowledge, heightened by the objective of giving as much aid as possible to users in developing countries. (Basic history of major areas of study is, however, covered in such articles as POPULATION THEORY, MATHEMATICAL DEMOGRAPHY, and BIRTH CONTROL MOVEMENT.) We chose to exclude biographies for much the same reasons, and also because biographical materials are widely available in other works, including the *IES* and the *IESS*, which includes a recent supplement containing 215 biographies of social scientists, many of whom are identified with the population field. We considered having numerous entries on organizations active in the population field, but reduced these to a very few, both for space reasons and because such information is subject to rapid change.

Geographic coverage is provided through separate articles on the eleven largest countries (and for Canada), covering 65 percent of the global population and ranging in size from China, at nearly 1 billion, through India, the Soviet Union, the United States, Indonesia, Brazil, Japan, Bangladesh, Pakistan, Nigeria, to Mexico at 70 million. At this point there is a natural cutoff, as the next several countries in size cluster between about 50 and 60 million. Therefore, all other countries are discussed in regional entries covering Asia, the Caribbean region, Europe, Latin America, North Africa and Southwest Asia, North America, Oceania, and sub-Saharan Africa. Accompanying maps, adapted from an equal-area (Mollweide) projection, show the principal geopolitical units of each region. On certain topics, articles are included with particular reference to the United States, in part because of the exceptional wealth of data and analysis here and in part because of the publishing venue.

Another early decision was that, while the project would rest foremost with the staff of the Center for Population and Family Health, the bulk of the writing would be from outside contributors. For a work of this size, it was evident that the highest quality, broadest scope, and most rapid preparation would come from experts, each writing in a familiar area of specialization. This proved to be true, even the rapid preparation, for we have been fortunate indeed in the contributors' response to demands of schedule.

The 123 authors of the 129 articles in the *IEP* are located in some 52 organizations here and abroad: in universities, United Nations agencies, research institutions, government agencies, and private organizations. As a group, the contributors exhibit a diversity of academic disciplines, professional experience, and national origins. The common characteristic of all contributors is expertise in the topic in question, and we express here our indebtedness to each one for the quality of scholarship and the patience with the editorial process that matter so greatly in the production of a work of this type.

Using the Encyclopedia

The reader's target is in every case an article or articles containing the information wanted, and several aids are built into the *IEP* that act as pathways to that information. Most users will start by looking directly for the most plausible article title that comes to mind; if this fails, the user commonly goes to the index. But other devices are also important.

1. The *list of articles* gives all main entries in alphabetical order and shows the groupings of two or more closely related articles entered under a single title. This list will frequently suggest additional entries to consult when the initial one tried is unsatisfactory.

2. The *topical outline of contents* shows article titles arranged in a different way, under eleven general headings. This outline in effect replaces the alphabetical sequence by a textbook arrangement that will be useful to those using the *IEP* to investigate a larger subject more extensively, and to those drawing upon it for teaching or course-work purposes. Note the multiple listing of some articles: where an article is relevant to more than one main heading, it appears under each one. The eleven headings also serve as a brief overview of the content of the volumes:

    I.   Field of Population
    II.   Data Sources, Measures, and Methods
    III.   Population Dynamics
    IV.   Fertility
        A. Fertility Determinants
        B. Fertility Regulation
    V.   Marriage and Divorce
    VI.   Morbidity and Mortality
    VII.   Distribution, Migration, and Urbanization
    VIII.   Population and Natural Resources
    IX.   Population Laws and Policies
    X.   World Regions and Countries
    XI.   Organizations and Agencies

3. *Composite entries,* a helpful editorial device borrowed from the *IESS,* allow systematic discussion of several components of a topic under one general entry title. An example is the entry EDUCATION, which includes three articles: POPULATION EDUCATION, SEX EDUCATION, and TEACHING DEMOGRAPHY. A few composite entries contain one or more overview articles and an article that focuses on the United States; for example, the entry DATA COLLECTION includes articles on NATIONAL SYSTEMS, INTERNATIONAL SYSTEMS, and UNITED STATES CENSUS. Other composite entries separate the discussion of population issues in developing countries and developed countries.

4. *Core entries,* written by the editorial staff, are an innovation of the *IEP.* They define important terms and concepts and refer the reader to articles that cover related aspects of a general topic. The core entry GOVERNMENT POLICY, for example, identifies articles that discuss specific policies, such as those concerned with fertility regulation, the family, and migration and distribution, as well as those that discuss the subject more generally. Core entries appear on the following topics: contraception, demography, developed countries, developing countries, family planning, fertility, government policy, law, marriage, migration, mortality, organizations and agencies, and statistical methods.

5. *Cross-references* lead the reader from one article to others that provide related information. Cross-references usually follow each article, but some appear in an editorial note preceding an article, and some are located within the text of an article. If a cross-reference pertains to one or more articles within a composite entry, the article titles are given as well as the entry title. As a visual aid, entry titles are printed with an initial capital letter; titles of articles within a composite entry are printed in even small capitals.

Thus, the reader advised to "*See also* CONTRACEPTIVE METHODS, *article on* ORAL CONTRACEPTIVES AND INTRAUTERINE DEVICES" is immediately directed to look under "C" rather than other letters of the alphabet.

6. *Blind entries* appear throughout the alphabetical order of the volumes. These are mainly synonyms or inversions of titles of entries that appear in another alphabetical location. The reader who consults the entry FORECASTS, for example, is directed to "*See* PROJECTIONS"; the reader who looks for an article under POPULATION, WORLD is directed to "*See* WORLD POPULATION."

Editorial Practices

We have tried to be both helpful and consistent in our choice and application of certain editorial conventions for presenting data, in general following precedents set in the *IESS.* Examples deserving special note are the following: (1) the full names of researchers are given on first mention in each article; (2) measurements are given in both metric and English units; (3) rates used throughout the *IEP* have a standard base, and conform to definitions provided in the article on RATES AND RATIOS; (4) common, and widely known, names have been used for geopolitical units; (5) full and accurate names of organizations have been given on first mention in each article, and for those areas in which European languages are spoken, organizations have been named in the language of their location.

We have attempted to present the most recently available data throughout the *IEP,* and we wish again to acknowledge the contributors' full cooperation in this regard. They updated text, tables, and figures from first draft to last, often incorporating new data as they became available. Some 122 tables and 66 figures are included herein, carefully selected for saliency.

As our basic reference for editorial style we have used the University of Chicago Press *Manual of Style,* 12th ed., rev. (1969). Other references we have used include *Webster's New Collegiate Dictionary,* 8th ed. (1974), *Webster's Third New International Dictionary* (1976), and the Macmillan Publishing Company's *Guide to the Spelling of Chinese Names.*

Bibliographies

The bibliographies serve two purposes: to document works mentioned in the articles and to give sources for additional reading on the topics of articles. In compiling their bibliographies, contributors were asked to include a selection of easily available sources for the reader wishing to investigate the topic further and to bear particularly in mind the reader lacking access to extensive library resources. As the editorial format of the *IEP* developed, the contributors' original bibliographies were often supplemented and strengthened as the relationships among the articles became clear and as new publications appeared.

Every bibliographic reference in the *IEP* has been verified for accuracy and reviewed for thoroughness of data. In almost all instances verification was accomplished by "hands-on" checking of the original document by a team of researchers using the rich bibliographic resources in the New York area. If copies of publications were unavailable in local libraries, contributors were asked to assist in verification of data by supplying copies of documents or evidence of publication. Occasionally, we accepted data from a reliable secondary source.

The bibliographic style evolved from our need to include references to an unusually wide variety of publications and from our wish to present bibliographic data in a uniform and systematic manner that would be readily understood by a worldwide audience. We have used few abbreviations, have frequently included helpful annotations, and have striven for consistency and clarity throughout.

Thus, we have made an exceptional effort to ensure the helpfulness, accuracy, and thoroughness of the bibliographies in the *IEP.* We trust that we have been successful, and we hope that they will be regarded as a carefully developed tool to aid additional investigation in all areas of population study.

Acknowledgments

INTERNATIONAL ENCYCLOPEDIA

OF

Population

A

ABORTION

1. Induced Abortion   Christopher Tietze
2. Medical Techniques   Vera Plaskon
3. United States   Jacqueline Darroch Forrest

1.
INDUCED ABORTION

The term "abortion," as used in this article, refers to the induced termination of a pregnancy before the fetus has become capable of surviving, with appropriate life support, the neonatal period and eventually maintaining an independent extrauterine life. An abortion may be induced legally or illegally, according to the laws of each country. Spontaneous abortions, including stillbirths, are discussed elsewhere in this work.

Sources of Data. The principal sources of information on the incidence of induced abortion are official statistics in countries where abortion has been legalized. In most of these countries laws require that all legal abortions be reported to health authorities, and in most of these countries, but not in all, nationwide statistics are published periodically. The completeness and accuracy of reporting and the quantity and quality of tabulations vary widely among and within countries.

Reporting is probably most complete where a procedure for authorization is prescribed by statute and where all legal abortions must be performed in hospitals or other facilities subject to official licensure; it is likely to be least complete for abortions performed in the offices or surgeries of medical practitioners in private practice. In addition to underreporting, reporting may be faulty in regard to such personal characteristics as residence, age, and weeks of gestation, especially if legal or financial considerations are involved. Marital status may be misstated and prior induced abortions denied to avoid embarrassment.

Reliable statistical data on illegal abortion are almost entirely lacking. While information on contraceptive practices has been successfully obtained in many countries by interviewing samples of women (usually married women), and occasionally of men, drawn from the general population, efforts to estimate the incidence of illegal abortion by such surveys have been far less successful. Apparently many respondents are willing to reveal their contraceptive practices to an interviewer but are not willing to report experience with illegal or even legal abortion. The classic example is the Fertility and Family Planning Study of 1966, conducted in Hungary more than a decade after the legalization of abortion. In that survey, the numbers of abortions reported by the respondents for the years 1960–1965 corresponded to only 50–60 percent of the number actually performed, according to reports from hospitals.

Statistical Methodology. The primary research tools for the demographic evaluation of abortion are (1) *distributions* by characteristics of the woman, such as her age, marital status, number of prior births or of prior induced abortions, or of the procedure itself, such as the duration

1

of pregnancy at the time of termination; (2) abortion *rates* per 1,000 women; and (3) abortion *ratios* per 1,000 live births or pregnancies. The number of live births plus legal abortions is usually substituted for the unknown number of all pregnancies.
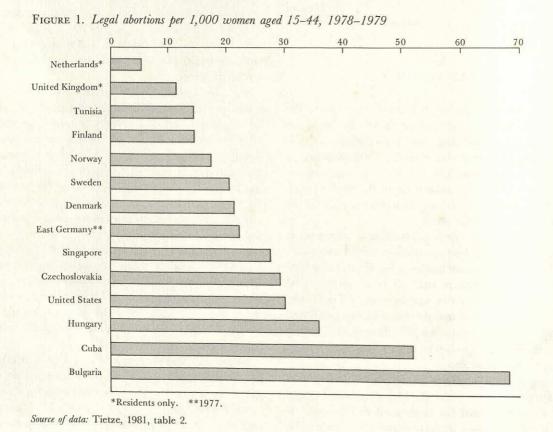
The importance of a sharp distinction between abortion rates and abortion ratios is illustrated by the following example. Assume two countries, each with 1 million women aged 15–44, one with 160,000 live births and 40,000 abortions, and the other with 75,000 live births and 25,000 abortions. The abortion rates are 40 and 25, respectively, per 1,000 women, the abortion ratios, 200 and 250 per 1,000 known pregnancies. Hence, one of these two countries has the higher abortion rate and the other has the higher abortion ratio. The abortion ratio corresponding to a given abortion rate is higher when the birth rate is low than when the birth rate is high.

Incidence of Abortions. The number of pregnancies terminated each year by induced abortion throughout the world is not known. The estimate of 55 million published by the International Planned Parenthood Federation in 1974 is highly speculative since it is based on country estimates that are, in many instances, of questionable validity. Legal abortions totaled about 4 million according to the latest official reports. However, this ex-

cludes the two countries with presumably the largest numbers of legal abortions: China and the Soviet Union.

It is highly improbable that any population has ever attained a low level of fertility without major recourse to abortion either as a primary method of fertility regulation or as a back-up procedure for contraceptive failure. Among low-fertility countries, the level of the abortion rate appears to be primarily determined by the availability, accessibility, and acceptability of contraceptive services, including surgical sterilization. Legal restrictions probably have some effect on the total number of induced abortions, but the effect of newly imposed restrictions tends to be temporary rather than permanent. The major effect of the recent liberalization of abortion laws in many countries appears to have been a replacement of illegal abortions by legal abortions rather than a replacement of unwanted births by induced abortions. Effects on contraceptive practice and on the sexual behavior of the unmarried remain matters of controversy, given the inconclusive nature of available empirical data.

In most of the low-fertility populations of Europe and North America, with liberal abortion laws and well-established contraceptive habits, abortion rates during the late 1970s ranged from a low of 5 to a high of 35 per 1,000 women aged 15–44 (see Figure 1), with abortion

FIGURE 1. *Legal abortions per 1,000 women aged 15–44, 1978–1979*

*Residents only.   **1977.

Source of data: Tietze, 1981, table 2.

ratios from about 100 to more than 300 per 1,000 known pregnancies. In many of these countries the rates and ratios appear to have stabilized in recent years. In some, the abortion rate was declining.

Much higher rates of legal abortion, ranging from 90 to 240 per 1,000 women of reproductive age, have been reported in earlier years from Hungary and Romania, or estimated for such countries as Japan and the Soviet Union. Equally high rates of illegal abortion probably existed or exist in other low-fertility populations with restrictive abortion laws.

Only a few countries in the developing world have liberalized their abortion laws and collect statistics on the abortions performed under these laws. Cuba reported a rate of almost 70 per 1,000 in 1974; more recently the rate has declined with a concurrent decline in fertility suggesting increasing use of contraception. Singapore's legal abortion rate has risen sharply to levels roughly equal to those reported in the United States. The rate of abortions performed under the national family planning program in Tunisia, although still lower than in Singapore, is much higher than the rate for residents in England, and the number of abortions in the Tunisian private sector, while not reported, is doubtless substantial.

In India, on the other hand, the number of medical terminations of pregnancy (MTP's), according to official statistics, remains quite small (2.3 per 1,000 women aged 15–44 in fiscal year 1979), probably less than one-twentieth of the total number of abortions performed each year by medically qualified and unqualified practitioners. No nationwide or representative data are available for the People's Republic of China or for Vietnam.

The incidence of illegal abortions is believed to be high in many urban areas of developing countries, especially in Latin America.

Demographic Characteristics. The three basic demographic variables relevant to the analysis of abortion data are the woman's age, parity (number of prior births), and marital status. Comprehensive information on all three elements is available for only a few countries in Europe and North America. It reveals significant differences. In western Europe (notably in the United Kingdom) and in the United States, one-half or more of the women obtaining legal abortions are under 25 years of age, unmarried, or childless, while in eastern Europe (Czechoslovakia and Hungary) older, married, and parous women predominate. This difference appears to reflect, to some extent, an earlier onset and higher level of sexual activity among the unmarried young in Western countries, but even more a less general and less effective use of contraception among married couples in eastern Europe.

The next step beyond the assessment of distributions is the computation of abortion rates and abortion ratios. The first two columns of Table 1 show such rates and ratios for the United States in 1977. The abortion rate per 1,000 women is seen to increase from the youngest age group to a peak at 18–19 years, followed by a steady decline to a very low rate among women in their forties. The abortion ratio per 1,000 known pregnancies presents an almost inverse pattern, declining from the youngest age group to a low at 25–29 years, when most women are married and building their families, followed by an increase to the highest ratio among the oldest women, who abort more pregnancies than they carry to term.

The pattern of abortion ratios by parity in the United States follows, to some extent, the pattern by woman's age. The abortion ratio is high among nulliparous pregnant women, most of whom are unmarried, drops to a low among women with one child, and then increases to parity four. The decline of the abortion ratio among women with five or more children reflects the presence in the population of an undetermined number of women who reject abortion under all circumstances. Such women are, of course, overrepresented among those with large families.

Not surprisingly, the abortion ratio is much higher for the unmarried than for the married. It should be noted, however, that abortions and live births are reported by marital status at the time of the event, not at the time of conception. Since some women who conceive out of wedlock marry and give birth within marriage, the abortion ratio for the unmarried is inflated and that for the married is somewhat reduced. The high abortion rate among the unmarried attests directly to the frequency of out-of-wedlock pregnancy.

The last two columns of Table 1 show comparable data for Hungary in 1973, that is, prior to the implementation of restrictions on legal abortions for married women with fewer than three children. With 73.5 legal abortions per 1,000 women aged 15–44 and more than 500 abortions per 1,000 known pregnancies, both rate and ratio were the highest reported from any country at that time. Comparison with the United States reveals a number of major differences not only in levels but also in patterns. (1) The peak of the abortion rate occurs at 25–29 years rather than at 18–19 years. (2) The abortion ratio increases steadily from parity zero to parity two. (3) The decline of the abortion ratio starts at parity three rather than at parity five and over. (4) While the abortion ratio is higher for unmarried than for married women, as in the United States, the opposite is true for the abortion rate. The extent of these differences underlines the necessity of analyzing the pattern in each population on its own merits.

An additional caveat is required: the data for both the

TABLE 1. *Abortion rates per 1,000 women aged 15–44 and abortion ratios per 1,000 known pregnancies by woman's age, prior births, and marital status: United States, 1977, and Hungary, 1973*

	United States, 1977		Hungary, 1973	
	Abortion rate	Abortion ratio	Abortion rate	Abortion ratio
Total	26.9	286	73.5	506
Age (years)[1]				
14 or less	3.9	402	1.2	305
15–17	26.8	379	18.1	334
18–19	54.9	363	65.1	345
20–24	45.3	283	98.3	389
25–29	27.8	207	105.6	508
30–34	16.0	233	95.1	601
35–39	9.8	368	68.5	814
40 or more	3.8	522	28.2	886
Prior births				
0	n.a.	348	n.a.	303
1	n.a.	190	n.a.	461
2	n.a.	274	n.a.	775
3	n.a.	297	n.a.	759
4	n.a.	298	n.a.⎫	634
5 or more	n.a.	246	n.a.⎭	
Marital status				
Married	11.0	98	90.2	461
Unmarried	46.6	660	50.5	791

[1]Abortion rate = age at abortion; abortion ratio = estimated age at conception. Abortion rates for women aged 14 years or less and 40 years or more are computed per 1,000 women aged 13–14 and 40–44, respectively. Abortion ratios are computed per 1,000 legal abortions plus live births six months later.   n.a. = not available.

Sources of data: Tietze, 1981, tables 2, 5–7, 9, and 11, supplemented by unpublished data for the United States (abortion rates for women aged 19 or less and by marital status) and Hungary (rates and ratios for women aged 19 or less and rates by marital status).

United States and Hungary are period data, not cohort data. Neither country has a time series of statistics covering all or most abortions *and* extending over thirty years, which would permit an assessment of the patterns for a single cohort, nor is such a series available for any other population. Recognition of this fact counsels caution in the interpretation of the rates and ratios shown in Table 1.

Repeat Abortions. The issue of repeat abortion is a matter of concern especially for those who believe that abortion is unacceptable as a primary method of fertility regulation and that it should be used only as a backup measure when contraception has failed. Others fear that even minor adverse effects on the health of the woman or on the outcome of later pregnancies might accumulate with multiple abortion experience.

Repeat abortions, especially those of third and higher orders, have increased rapidly in countries, such as the United States, where restrictive laws and practices have only recently been replaced by relatively easy access to abortion. This increase does not reflect a progressive change from contraception to abortion as the primary method of fertility regulation but rather the growing number of women who have had a first legal abortion and so are at risk of a repeat abortion.

Rates of repeat abortions per 1,000 women at risk of experiencing them tend to be higher than rates of first abortions in the same populations at the same time. This finding should not be interpreted as evidence for a deterioration of contraceptive practice after the first abortion. Rather, the difference reflects the heterogeneity of the populations concerned. With and without contraception, the incidence of unintended pregnancies varies with age, parity, and marital status. Access to abortion services may vary widely among localities and socioeconomic groups. In addition, within each group, attitudes and behavior range as a continuum from complete rejection of abortion under all circumstances, to acceptance of abortion in some situations (e.g., for termination of out-of-wedlock pregnancy or for family limitation, but not for child spacing within marriage), to acceptance of abortion for all unintended pregnancies. It can be demonstrated that, other factors being equal, the difference between first-abortion rates and repeat-abortion rates

increases with the degree of heterogeneity of the population with regard to abortion practices.

Period of Gestation. Because of its overriding importance for postabortal morbidity and mortality, the period of gestation at which pregnancies are terminated is a leading indicator for the evaluation of abortion practices.

While the traditional division has been made between abortions in the first trimester and those in the second trimester, that is, between those performed at twelve weeks from the onset of the last menstrual period or earlier and those at thirteen weeks or later, accumulating experience, primarily in the United Kingdom and the United States, has made it clear that this traditional separation is not sufficient, because morbidity and mortality increase with the progress of gestation even within each trimester.
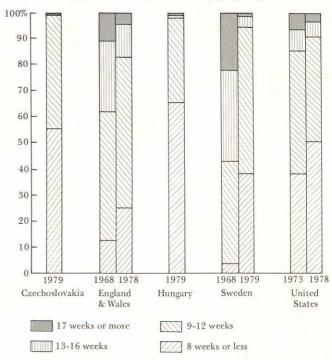
In most countries where termination of pregnancy at the woman's request or on social indications is authorized, abortions on these grounds are permitted only during the first trimester. Notable exceptions are Australia, India, Japan, Singapore, Sweden (to eighteen weeks), the United Kingdom, and the United States. Even where legally permitted, very few abortions are performed after the twenty-fourth week of gestation.

A shift toward earlier abortion has occurred in almost all countries for which data are available, most dramatically in Sweden, where the mean duration of pregnancy dropped from 14.1 weeks in 1968 to 9.9 weeks in 1979 (see Figure 2). This trend probably reflects (1) a growing awareness among women and physicians that abortion is less dangerous early in pregnancy than later on and (2) the increasing availability of abortion services, at least in some areas.

Late abortions occur most frequently among women of low socioeconomic status and especially among the youngest women. The strong inverse association of period of gestation and woman's age probably reflects the inexperience of the very young in recognizing the symptoms of pregnancy, their unwillingness to accept the reality of their situation, their ignorance about where to seek advice and help, and their hesitation to confide in adults. Economic considerations and, in many places, regulations prohibiting surgery on minors without parental consent also contribute to delays.

Slightly lower proportions of abortions performed at eight weeks or earlier, combined with increased second-trimester procedures, observed in most countries among older women, reflect primarily the association of high-order pregnancies with economic and cultural deprivation. Abortions on medical grounds are also more common among older women, and some women in their forties may misinterpret the amenorrhea of pregnancy as the onset of menopause.

FIGURE 2. *Legal abortions by duration of pregnancy*

Source of data: Tietze, 1981, table 15 (updated for Hungary).

No information is available on the timing of illegal and self-induced abortions for any country. Survey data are not reliable sources of information, because a long time may have elapsed between the abortion and the interview; nor are hospital records to be depended on for such data, because the risk of complications requiring medical attention is higher after a late abortion than after an early one.

The duration of pregnancy at the time of abortion also determines the number of abortions required to replace one live birth. In reference to a given pregnancy, the number required is, of course, "one," since a pregnancy can be terminated only once, but a different answer is required when an entire population is considered.

The interval between two successive conceptions has three components: (1) the pregnancy itself, (2) a postgestational anovulatory period during which conception cannot occur, and (3) an ovulatory period during which the monthly probability of conception is more than zero but less than one. The anovulatory period is prolonged if the infant is breastfed.

Induced abortion reduces components (1) and (2), because the duration of pregnancy is shortened from about nine months for a live birth to about three months for an abortion, and the postgestational anovulatory period is also shortened following an abortion compared with a live birth. The average time required for conception dur-

ing the ovulatory period (3) is presumably not affected. With breastfeeding of moderate to long duration and without contraception, component (2) is comparatively long and component (3) is short, and the net effect is that two to three abortions are required to avert one live birth. If contraception is effectively practiced, (3) is extended relative to (1) and (2), with the result that only slightly more than one abortion is required to avert one birth. Abortion alone is an inefficient method of fertility regulation; however, it becomes progressively more efficient as the expanding use of contraceptives relegates its role to a backstop measure.

Concurrent Sterilization. When an abortion is performed because the pregnant woman suffers from a permanent physical, mental, or genetic impairment, or because she desires no further children, the abortion may be combined with surgical sterilization. The frequency of such concurrent procedures varies substantially among countries—from about 50 percent of all legal abortions down to virtually zero. A very high prevalence of postabortal sterilization in India is associated with high percentages of older women, married women, and women of high parity among those obtaining legal abortions, whereas a low rate in the United States and Sweden is associated with high percentages of young and single women pregnant for the first time. In the United Kingdom and Canada, however, the prevalence of postabortal sterilization has been high even though the distribution of women obtaining abortions by age, marital status, and parity is similar to that in the United States and Sweden. On the other hand, in the countries of eastern Europe and in Japan, a low prevalence of postabortal sterilization is associated with high percentages of older, married, and parous women.

In recent years, the proportions of legal abortions that are combined with sterilizing procedures have declined markedly in most countries. Because the total numbers of abortions have increased, this downward trend may be less marked or even absent when the frequency of combined procedures is expressed as a rate per 1,000 women of reproductive age.

Complications. Induced abortion, at any period of gestation, exposes a woman to a risk of complications that is always larger than zero but that can vary considerably, depending on the circumstances under which the abortion is performed. The severity of complications also varies widely from very minor complaints to the occasional fatal outcome. Complications can be divided into two categories—early, that is, within around one month after the abortion, and late, those occurring more than one month after the procedure. Early complications may be further subdivided into immediate complications, defined as those occurring during the procedure or within a few hours after its completion, and delayed complications, those developing later but still within one month.

Serious immediate complications are rare with abortions performed in medical settings. They include perforation of the uterus by one of the instruments used in vaginal evacuation, major hemorrhage, severe disturbances of blood coagulation associated with saline-induced abortions, and untoward effects of general or local anesthesia. The most frequent delayed complications are caused by retention of fragments of the placenta, resulting in postabortal bleeding, and infection that may range from mild endometritis through more severe forms of pelvic inflammatory disease to generalized peritonitis and septicemia.
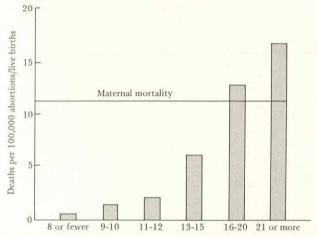
Over the past decade, a major concern has been the possible adverse effect of induced abortion on the outcome of subsequent pregnancies. Using different methodologies, several authors have reported an increased risk of low birth weight, short gestation, and spontaneous abortion in the second trimester. Other investigators could not confirm these observations. It is not possible, at the present time, to make a definitive statement as to the existence, let alone the magnitude, of significant adverse effects of abortions induced in medical settings on the outcome of subsequent pregnancies. Risks to these outcomes are of major interest in countries where a substantial proportion of first and second pregnancies are terminated by abortion. Further research is clearly indicated. Some such studies are now underway, offering hope that it will eventually become clear what the risks are, what causes them, and how they can be avoided or reduced.

Mortality. Any discussion of abortion-related mortality must give separate consideration to procedures performed by qualified medical practitioners in legal settings and those performed or initiated by other persons in other settings.

With the increasing experience of practitioners, mortality associated with legal abortions has dropped to very low levels (3 or fewer deaths per 100,000 abortions), at least in developed countries. A major contributory factor has been the trend toward earlier termination because the risk to life increases steeply with the duration of pregnancy. In the United States during 1972–1978, mortality ranged from 0.4 per 100,000 legal abortions at eight weeks or less to 16 per 100,000 for abortions at twenty-one weeks or more (see Figure 3).

Abortion-related mortality may be compared appropriately with the risk to life associated with carrying a pregnancy to term. In the United States, maternal mortality attributed to complications of pregnancy and childbirth, *excluding* abortion and ectopic gestation, declined to 11.2 deaths per 100,000 live births in 1972–1978. Most of these deaths occurred late in pregnancy,

FIGURE 3. *Deaths per 100,000 legal abortions by weeks of gestation and maternal mortality per 100,000 live births, United States, 1972–1978*

Source of data: Tietze, 1981, table 21.

during labor, or during the puerperal period. Adjustment to the age distribution of women obtaining legal abortions raises maternal mortality at birth to about 15 per 100,000.

It is generally recognized that mortality is much higher following abortions that are self-induced or induced by untrained persons than after those legally performed in hospitals and clinics. It is impossible, however, to quantify these higher risks, since mortality reflects not only the skill of the persons performing or initiating the illegal abortion but also the availability, utilization, and quality of subsequent medical and hospital services in the event that life-threatening complications develop.

National statistics on abortion-related mortality, based on the registration of deaths by cause, are now available for numerous countries, although they are still lacking for eight of the ten most populous nations. While deaths attributed to spontaneous and legally induced abortions are included, these statistics reflect primarily mortality associated with illegal abortions.

The reported rates of abortion mortality appear to be more closely associated with the availability of modern methods of contraception (including surgical sterilization), with the general level of health services, and with the adequacy of the registration system than with the legal status of abortion or the presumed incidence of illegal abortions performed by untrained operators.

Historically the highest reported mortality rates from abortion (Prussia, 1920s; United States, nonwhites, 1930s; Chile, 1960s) have been on the order of 150 to 200 per million women aged 15–44, corresponding to 0.03 to 0.05 per 1,000 persons per year. Even with a generous

allowance for misreporting of cause of death, this was hardly a major contribution to the crude death rate of the period. In recent decades, abortion mortality has declined in most countries publishing mortality statistics, with and without changes in their abortion laws, although the decline was usually accelerated by the adoption of a more liberal statute. By the mid-1970s, the typical rate in countries with liberal abortion laws, good medical services, and generally good statistics was on the order of 1 death or less per million women of reproductive age. In Romania, following replacement of abortion on request by a restrictive law, abortion mortality increased from 14.3 per million women aged 15–44 in 1965 to 97.5 per million in 1978.

A final issue concerns the relative risk to health associated with legal abortion, compared with other methods of fertility regulation. Table 2 illustrates these risks in terms of mortality rates per 100,000 sexually active women per year, by five-year age groups. Mortality rather than morbidity has been chosen as the indicator of "risk to health" because the nonfatal complications associated with abortion and some contraceptive methods differ so widely in their nature and severity as to be essentially noncomparable. The deaths include not only those directly attributable to the method but also those associated with complications of pregnancies and births resulting from contraceptive failure.

The analytical tool for the estimation of mortality rate is a computer model that simulates sets of reproductive events occurring during the childbearing years of a hypothetical birth cohort of women under various regimens of fertility regulation. The cohort is moved through the reproductive ages in steps of one month, each step representing sequential physiological states of fecundability, pregnancy, and postgestational nonfecundability, under specified assumptions as to contraceptive effectiveness, until permanent sterility intervenes.

It should be noted that because the assumptions as to contraceptive effectiveness and mortality used in the computations are derived from data originating in the United States and the United Kingdom, the model is applicable to developed countries only and not to countries with higher maternal mortality and less-adequate medical facilities and services than those on which the assumptions are based. Furthermore, some of the mortality risks in this analysis are based on studies involving small numbers of cases that are subject to varying, but often major, sampling errors.

The outstanding findings are three.

1. Among women under 30 years of age, with the exception of pill takers who smoke, the total risk to life associated with each of the major methods of fertility regulation used alone is about equal and quite low (on

TABLE 2. *Birth-related, method-related, and total deaths per 100,000 women per year, by regimen of control and age of woman*

Regimen and type of deaths	Age (years)					
	15–19	20–24	25–29	30–34	35–39	40–44
No control						
Birth-related	5.3	5.8	7.2	12.7	20.8	21.6
Abortion only						
Method-related	1.0	1.9	2.4	2.3	2.9	1.7
Pills only/nonsmokers						
Birth-related	0.1	0.2	0.2	0.4	0.6	0.4
Method-related	0.6	1.1	1.6	3.0	9.1	17.7
Total deaths	0.7	1.3	1.8	3.4	9.7	18.1
Pills only/smokers						
Birth-related	0.1	0.2	0.2	0.4	0.6	0.4
Method-related	2.1	4.2	6.1	11.8	31.3	60.9
Total deaths	2.2	4.4	6.3	12.2	31.9	61.3
IUDs only						
Birth-related	0.1	0.2	0.2	0.4	0.6	0.4
Method-related	0.8	0.8	1.0	1.0	1.4	1.4
Total deaths	0.9	1.0	1.2	1.4	2.0	1.8
Barrier methods only						
Birth-related	1.1	1.5	1.9	3.3	5.0	4.0
Barrier methods, plus abortion						
Method-related	0.1	0.3	0.4	0.4	0.4	0.2

SOURCE: Tietze and Lewit, 1979, table 3; reprinted by permission.

the order of 1–2 per 100,000 women per year), significantly lower than the birth-related risk to life without fertility regulation. Pill takers who smoke approach that risk in their late twenties.

2. Beyond age 30, the risk to life (which is almost entirely method-related) increases rapidly for pill users, especially those who smoke. After age 35, the risk for pill users who smoke is higher than for women using neither contraception nor abortion; after age 40, it is three times higher. For all other methods, the risk to women aged 30–44 remains virtually constant or (for those using barrier methods without abortion backup) increases moderately, but it remains far below the level of mortality associated with complications of pregnancy and childbirth without fertility regulation.

3. At all ages, the lowest level of mortality by far is achieved by a combined regimen, that is, use of barrier contraceptives with recourse to early abortion in case of failure.

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For discussion of the legal aspects of abortion, see LAW AND FERTILITY REGULATION.

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2.
MEDICAL TECHNIQUES

Abortion as a means of controlling unwanted fertility has been practiced since ancient times in almost all countries of the world. Some folk methods to induce abortion are still practiced today. Folk methods range from the drinking of teas made with a variety of herbs or other plant products to the insertion of caustic substances into the vagina or to the insertion of twigs or other sharp objects into the uterus itself. These methods are ineffectual in most instances and can cause severe damage to the

woman, often leading to her death. In recent years, as a result of the reduction of legal prohibitions against abortion in many parts of the world and scientific and clinical advances, more refined and effective methods of abortion have been developed.

Current medical procedures for inducing abortion can be classified into three categories: (1) instrumental evacuation of the uterus by the vaginal route; (2) stimulation of uterine contractions; (3) major surgery.

Instrumental Vaginal Evacuation. The four methods of instrumental vaginal evacuation are suction curettage, dilatation and curettage, endometrial aspiration, and dilatation and evacuation.

Suction curettage. Suction curettage consists of two steps: first, a dilatation, or opening, of the cervical canal to provide access to the inside of the uterine cavity; and second, a systematic removal of the products of conception by the use of vacuum aspiration. Dilatation of the cervical canal is usually performed by inserting rod-shaped metal instruments of gradually larger size into the canal until it is open wide enough to permit removal of the products of conception. Cervical dilatation may also be achieved through the use of laminaria, a sterile, dry, rod-shaped seaweed, which, when placed in the cervical canal, expands the opening by gradually absorbing moisture from the cervix over a period of hours. Cervical dilatation may or may not be required prior to aspiration; the degree of dilatation necessary is dependent on the natural width of the cervical canal, the gestational age of the pregnancy, and the final size of the cervical canal desired.

Vacuum aspiration is performed with a suction cannula, essentially a hollow tube with an oval opening. The suction cannula is most often used with an electrical pump providing negative pressure at a level of 50 to 70 millimeters of mercury. Hand-operated models are also available. During the first few weeks of pregnancy the necessary vacuum also may be produced manually by means of a 50-milliliter syringe. The suction cannula, once inserted into the uterus, is systematically applied over the inner surface of the uterus until all the products of conception are removed.

Suction curettage is usually performed up to the twelfth week of pregnancy. It may be done as an inpatient or outpatient procedure under either local or general anesthesia. As of 1981, suction curettage was the most frequently used method of first-trimester abortion.

Dilatation and curettage. Surgical curettage, customarily known as dilatation and curettage (D&C), was the traditional method of first-trimester abortion until the development of suction curettage. It is still used as an abortion procedure but much less frequently than in the past.

Dilatation and curettage consists of two steps: first, a dilatation of the cervical canal (see description of suction curettage, above); second, a systematic scraping of the uterine cavity with a sharp metal curette to remove the products of conception. A curette is a small rounded instrument shaped like a hollow spoon with a sharp edge. D&C is usually performed up to the twelfth week of pregnancy. It may be done as an inpatient or outpatient procedure under local or general anesthesia.

Endometrial aspiration. Endometrial aspiration, also known as menstrual regulation (MR) or mini-suction, is a modification of the suction curettage method. It is usually performed within the first two weeks after a missed menstrual period when pregnancy cannot yet be verified by the usual urine tests or pelvic examination.

Endometrial aspiration is performed by inserting a small cannula through the cervix and into the uterus. Cervical dilatation is often not required because of the small amount of uterine contents to be aspirated and the small size of the cannula. The cannula may be attached to a hand-held 50 cubic centimeter syringe, and with the syringe plunger pulled back, the contents of the uterus are withdrawn by suction. Endometrial aspiration is generally performed as an outpatient procedure without anesthesia or with minimal local anesthesia or analgesia.

Three problems are associated with endometrial aspiration. (1) If the woman is not pregnant, she is unnecessarily exposed to a surgical risk. (2) Since the conceptus is very small at this time, it occasionally may be missed, and the woman, if indeed pregnant, would have to undergo a second procedure. (3) There may be a risk of missing an ectopic pregnancy.

Dilatation and evacuation. Dilatation and evacuation (D&E) consists of the following steps: first, dilatation of the cervical canal by the use either of metal instruments or laminaria (see description of suction curettage, above); second, evacuation of the uterus using a variety of instruments such as forceps, suction cannula, and sharp curette. D&E is used for abortions between thirteen and sixteen weeks of gestation. It has been used up to twenty weeks of pregnancy and occasionally up to twenty-four weeks. The later in pregnancy D&E is performed, however, the more technically difficult it becomes. A D&E procedure requires greater technical skill because the fetus is more fully formed and care must be taken to remove all the products of conception without damage to the cervix. D&E may be emotionally stressful to the person performing the operation and assisting personnel because at later gestational ages the fetus is more fully developed, a situation that often requires the crushing of bony fetal parts such as the skull in order to remove them from the uterus. However, D&E can be less emotionally traumatic for the woman than other methods used late in

pregnancy because it is a surgical procedure and she does not have to experience uterine contractions and vaginal expulsion of the fetus. D&E may be done under local or general anesthesia in an inpatient or outpatient setting.

Stimulation of Uterine Contractions. Stimulation of uterine contractions is used for induction of second-trimester abortion. Uterine contractions may be stimulated by intra-amniotic or extra-amniotic infusions of various compounds or the extra-amniotic insertion of mechanical devices. These methods may be used singly or in combination with one another in an attempt to shorten the time between abortion induction and vaginal expulsion of the products of conception.

Saline solution. Saline abortion is performed by inserting a needle through the abdominal wall and into the amniotic sac within the uterus. A small amount of amniotic fluid (usually 200 cubic centimeters) is removed and replaced with an intra-amniotic instillation of a hypertonic saline solution (usually 20 percent). After the instillation of the hypertonic saline solution, uterine contractions usually begin within twenty-four hours, the range being from twelve hours to as many as thirty-six hours. The average time from instillation to expulsion of the products of conception is twenty-four to thirty-six hours but may range up to seventy-two hours. Occasionally, when labor fails to begin within forty-eight hours, a second saline instillation may be performed. Administration of intravenous oxytocin (a naturally occurring substance that stimulates uterine contractions) may also be used at the same time to decrease the instillation-to-expulsion time. The precise physiological mechanism by which labor is induced by hypertonic saline is not completely known. Saline abortion is usually performed in an inpatient setting at sixteen weeks of pregnancy or later so that the uterus is large enough to be located for the correct instillation of the saline solution.

Complications associated with saline abortion include an increased level of salt in the blood (hypernatremia), which may be caused by an accidental intravascular injection of saline solution but may also happen in the absence of technical error. It is a serious problem, which may result in death if not promptly treated. Other complications include retention of the placenta, hemorrhage, infection, cervical trauma, disturbances of blood-clotting mechanisms, and failed abortion.

Prostaglandins. Prostaglandins (PG's) are naturally occurring substances in the body that affect many important physiological functions including those of reproduction. Since prostaglandins can cause contraction of the smooth muscle of the uterus and softening and dilatation of the cervix they are used to induce abortion. Synthetic prostaglandins and prostaglandin analogues have been developed through research; as of 1979, three prostaglandins, PGE_2, $PGF_2\alpha$, and 15-methyl-$PGF_2\alpha$, were approved by the U.S. Food and Drug Administration (FDA) as abortifacients.

Prostaglandin $F_2\alpha$ is instilled intra-amniotically and causes uterine contractions with subsequent vaginal expulsion of the fetus. The time from instillation to abortion varies, but the average of eighteen to thirty-two hours is generally shorter than with saline abortion. Side effects such as vomiting and diarrhea are common because the prostaglandin also induces contractions of the smooth muscle of the gastrointestinal tract. Repeated instillations are more frequently required than with saline instillation.

Instillation of prostaglandin $F_2\alpha$ is usually performed from sixteen to twenty weeks of pregnancy. With the use of prostaglandins, fetuses may show signs of life at expulsion, but because of their immaturity they are not viable. Prostaglandin abortions are usually performed in an inpatient hospital setting.

Prostaglandin E_2 is used in the form of a vaginal suppository for patients with missed or incomplete abortions, as well as for second trimester induced abortion. It is used primarily to soften and dilate the cervix, usually as an adjunct to other abortion procedures.

Experiments are being conducted with other forms of prostaglandins and other ways of administering them, for example, intravenous injections, intramuscular injections, oral pills, and vaginal suppositories or gels. These are not yet available for general use in the United States.

Less frequently used compounds. In addition to hypertonic saline solution and prostaglandins, a number of other compounds have been used to a lesser extent to induce uterine contractions in second-trimester abortion. Intra-amniotic or extra-amniotic instillations of urea or Rivanol (ethacridine) are seldom used because they appear to be less effective than other abortifacients. Hypertonic glucose solutions and medicated pastes have been tried as abortifacients, but they have been abandoned because of high rates of complications and several fatalities.

Mechanical Stimulation of Uterine Contractions. The laminaria-metreurynter combination method of second-trimester abortion, primarily used in Japan, involves the placement of two or three laminaria (see description of suction curettage, above) in the cervix for twenty-four hours, followed by the insertion of an inert device, the metreurynter (small rubber bag), between the amniotic sac and the wall of the lower uterine segment. The metreurynter is inflated with a saline solution to keep it in place in the uterus until the cervix is sufficiently dilated; a weight is attached to increase further its contraction-producing effect on the uterus. This method is believed to act by causing uterine irritation or inflamma-

tion, which results in uterine contractions and fetal expulsion. There are four major disadvantages. (1) Insertion-to-abortion time is often prolonged beyond the average time for either saline or prostaglandin abortions. (2) There is an increased risk of mortality and morbidity owing to infection. (3) Hospitalization and continuous medical care are required during the prolonged period of confinement. (4) There is a high incidence of live but not viable fetuses.

Major Surgical Procedures. Both hysterotomy and hysterectomy are considered major abdominal surgery. The number of abortions done by these methods is declining.

The procedure for hysterotomy is very similar to that for a Caesarean section but is done before the fetus is viable. An incision is made in the abdomen, and the uterus is surgically incised. The fetus, membranes, and placenta are removed and the uterine and abdominal incisions are then sutured. Hysterotomy must be performed in a hospital and requires the use of general anesthesia.

In hysterectomy, an incision is made in the abdominal wall and the entire uterus with the fetus and the placenta are removed. Hysterectomy both terminates the pregnancy and sterilizes the woman.

Both hysterotomy and hysterectomy are usually performed only when other methods fail, when a preexisting medical condition prohibits the use of another method, or when there are other maternal pathologies such as fibroid tumors or cancer. The risks of morbidity and mortality are the highest of all abortion methods. In the United States for the years 1972–1978, hysterotomy and hysterectomy procedures combined had a death-to-case rate of 41.3 per 100,000 abortions and carried a relative risk of death almost thirty-two times higher than suction curettage (United States, 1980).

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3.

UNITED STATES

From 1967, when abortion laws in some states first were liberalized, through 1979, approximately 7.4 million women in the United States obtained 9.4 million legal abortions. About 15 percent of U.S. women of reproductive age (15–44) have had a legal abortion since 1967. In 1978, there were approximately 1.4 million abortions in the United States—28.2 per 1,000 women of reproductive age and 29 percent of pregnant women (excluding those who had miscarriages). Each year, about 3 percent of women of reproductive age and three out of every ten pregnant women have abortions.

Sources of Data. There are two major sources of information about abortion services in the United States, the Alan Guttmacher Institute (AGI) and the Centers for Disease Control (CDC) in the U.S. Department of Health and Human Services.

The AGI monitors the availability and accessibility of legal abortion services by directly surveying abortion providers. Each year since 1973 it has surveyed all facilities identified as providing abortion services (public and private hospitals; nonhospital or free-standing abortion clinics; and physicians who perform abortions in their private offices) to estimate the number of abortions performed and the distribution and types of providers. AGI data are the only national information linking abortions to the type of provider. The AGI abortion surveys are designed to provide data for evaluating the adequacy of abortion services and for planning changes in services.

The other source of national data is the CDC's Family Planning Evaluation Division. The CDC collects information from central health agencies in most states and the District of Columbia and from hospitals and other facilities in the few remaining states that do not collect abortion information themselves. Data are assembled on the number of reported abortions, the characteristics of women obtaining abortions, and medical aspects of the

procedures. The safety of abortion is one of the CDC's chief concerns. Its Abortion Surveillance effort and Joint Program for the Study of Abortion/CDC provide information on abortion morbidity and mortality, as well as on method of abortion used and time of gestation at which the abortion is obtained, both of which affect the risk of complications. Because a number of states do not require the reporting of abortion and others do not have complete reporting, the CDC reports identify fewer abortions than do the AGI surveys; however, CDC data on the characteristics of the women obtaining abortions are used in conjunction with the more complete AGI counts of abortions.

Abortion Services. The use of legal abortion in the United States has increased steadily since 1973 (see Table 1). In all, 1,410,000 abortions were reported for 1978. Based on past trends and first-quarter 1979 reports, the projected number of abortions in 1979 was about 1,540,000. The number of legal abortions has increased each year since the 1973 Supreme Court decisions legalized abortion throughout the United States. Overall, the increase since 1973 has been 89 percent, but the rate of increase has decreased over time. The rate as well as the numbers have continued to increase. Between 1973 and 1978, the rate rose from 16.6 to 28.2 per 1,000 women of reproductive age.

In 1978, there were 416 abortions for every 1,000 live births in the United States. Of pregnant women (excluding women whose pregnancies ended in miscarriages and stillbirths) 29 percent terminated their pregnancies by abortion in 1978, compared with 19 percent in 1973.

Since 1974, legal abortions have been reported annually in every state. In 1978, the number of reported abortions ranged from 1,070 in Wyoming to 187,050 in New York and 234,520 in California (Henshaw et al., 1981a, p. 10). In most states the number of abortions has increased each year. Between 1977 and 1978, the number of reported abortions increased by at least 25 percent in

eleven of the fifty states. The number decreased in nine states and the District of Columbia (Henshaw et al., 1981b, p. 17).

The Need for Abortion Services. The number of women in need of abortion services is estimated by assuming that, if abortion services were readily accessible in all areas of the country, abortion rates would be similar to the age-specific and race-specific abortion rates in the five states with especially good accessibility of abortion services in 1978. In the United States as a whole, an estimated 2.1 million women would have had abortions in 1978 had services been readily available. This number is about two-thirds of the estimated number of unintended pregnancies that occurred in 1978.

In 1978, approximately 66 percent of these women obtained abortions but another 736,000 did not. The percentage of the need met is closely related to the abortion rate (but is standardized for age and race differences in population distribution) and varies across the country.

Geographic Concentration. Abortion services in the United States are highly concentrated in metropolitan areas. Since 1973, about 95 percent of all abortions reported each year occur in metropolitan areas (in counties in Standard Metropolitan Statistical Areas) even though only 75 percent of all U.S. women of reproductive age and in need of abortion services live in these areas. The overconcentration of services in urban areas is reflected in the abortion rates. In 1977 and 1978, the abortion rate was more than seven times higher in metropolitan than in nonmetropolitan areas (see Table 1). The AGI survey collects abortion information based on the locations where the abortions are performed, not where the women reside. Low rates in nonmetropolitan areas reflect the relatively poor availability and accessibility of services in these communities; many women living in nonmetropolitan areas either must travel to metropolitan communities for abortions or must carry their unwanted pregnancies to term. To the extent that nonmetropolitan women

TABLE 1. *Number of reported abortions; rate of abortions per 1,000 women aged 15–44; ratio of abortions per 1,000 live births, and ratio per 1,000 abortions plus live births; by metropolitan status, United States, 1973–1978*

Measure and metropolitan status	1973	1974	1975	1976	1977	1978[a]
Number of abortions (thousands)						
Total	744.6	898.6	1,034.2	1,179.3	1,316.7	1,409.6
Metropolitan	720.2	860.7	985.7	1,123.3	1,258.0	1,469.0
Nonmetropolitan	24.4	37.9	48.5	56.0	58.7	64.4
Abortion rate						
Total	16.6	19.6	22.1	24.5	26.9	28.2
Metropolitan	22.7	26.7	30.2	31.6	34.7	36.4
Nonmetropolitan	1.9	2.8	3.4	4.4	4.6	4.9

[a]Births six months later.
SOURCE: Henshaw et al., 1981a; reprinted by permission.

obtain abortions in metropolitan communities, abortion rates by occurrence are understated for nonmetropolitan women and overstated for metropolitan women.

Differences in abortion rates by state also reflect differences in availability of abortion services across states. Abortion rates in 1978 ranged from a low of 7.1 per 1,000 in West Virginia to a high of 46.1 in New York State (Henshaw et al., 1981*a*, p. 10). In twenty of the fifty states, fewer than 25 percent of the women of reproductive age in need of abortion services lived in counties without abortion providers; in all of these relatively well-served states, the abortion rate was over 20 per 1,000. The rate was above 20 per 1,000 in ten of the thirty-one less well-served states (where 25 percent or more of the women lived in areas that had no abortion providers).

Women Who Obtain Abortions. In the United States, women who obtain abortions are mainly young, white, unmarried, and childless; for most, the abortion was their first. More than nine-tenths of all abortions are now performed during the first trimester of pregnancy and by suction or dilatation curettage (see Table 2).

Adolescents account for nearly one-third of all abortions, but the percentage of abortions to adolescents decreased slightly between 1973 and 1978. Women aged 20–24 account for another third of all abortions, and that proportion increased slightly.

Of all 1978 abortions, 69 percent were obtained by whites. The proportion obtained by unmarried women increased steadily from 71 percent in 1973 to 77 percent in 1978. Of the women who obtained abortions in 1978, 57 percent had no living children.

The percentage of women obtaining their first abortion decreased from 85 percent in 1974 to 71 percent in 1978 as the number of women who had obtained abortions at some previous time in their life increased.

In each successive year since 1973, women have obtained abortions at much earlier—and much safer—gestation ages. The proportion of abortions performed at eight weeks' gestation or less increased from 38 percent in 1973 to 50 percent in 1978. The proportion of abortions estimated to have occurred after twelve weeks of gestation (in the second trimester) decreased from 15 percent in 1973 to 9 percent in 1978. With the shift to earlier gestational ages and with the development and increased use of the dilatation and evacuation procedure after the twelfth week, the proportion of abortions performed by suction or sharp curettage increased from 90 percent in 1973 to 95 percent in 1978.

Abortion Providers. The network of abortion providers in the United States is for the most part separate from the network of organizations providing contraception or sterilization. A very few family planning providers also offer abortion services, but there is no organized abortion services system similar to the family planning network and there is no federal program supporting abortion providers. The federal-state Medicaid program, however, does reimburse providers for abortions performed for poor women (in some states and at some times).

Abortion services in the United States are provided in public and private hospitals, in free-standing nonhospital clinics that specialize in abortion, and in physicians' offices. There were 2,753 identified abortion providers in the United States in 1978, a 69 percent increase from the 1,627 providers in 1973 (Henshaw et al., 1981*a*, p. 7). A facility is considered an abortion provider if it reports at least one abortion during the year. The rate of increase in the number of providers has been smaller each year— from 25 percent between 1973 and 1974 to 2 percent between 1977 and 1978.

Hospitals are the usual source of surgical care in the United States. Since 1973, the role of hospitals in providing abortion services has decreased and the role of nonhospital clinics has increased dramatically. Although the number of hospitals providing abortions increased 30 percent between 1973 and 1977, since 1976 the number has decreased. In 1978, 29 percent of all short-term, general, non-Catholic hospital facilities provided abortion services; 18 percent of the public hospitals and 36 percent of private hospitals provided abortion services (Henshaw et al., 1981*a*, p. 14). In contrast, the number of abortion clinics and physicians performing early abortions in their private offices more than doubled between 1973 and 1978.

Hospitals averaged 216 abortions each; even though they were 59 percent of all providing facilities, 25 percent of abortions were performed in hospitals in 1978, down from the 52 percent they accounted for in 1973 when abortion was legalized throughout the country.

The clinics are the largest group of abortion providers, averaging 1,731 abortions each in 1978. These clinics are nonhospital, free-standing facilities, which usually specialize in providing abortion care. Most of the abortions in the United States are performed in these clinics. Although they made up only 21 percent of all providers, they account for 71 percent of all abortions (Henshaw et al., 1981*b*, p. 47). Abortions performed in physicians' offices continue to remain a small proportion of total abortions.

Limits on Service Accessibility. In 1978, there was no abortion provider in 77 percent (2,387) of the 3,105 U.S. counties. An estimated 574,200 women in need of abortion services (27 percent of the total need) lived in these unserved counties. In these counties, there were 2,569

TABLE 2. *Number and percentage distribution of legal abortions, by selected characteristics, 1973 and 1978*

Characteristic	Number		Percentage distribution	
	1973	*1978*	*1973*	*1978*
Total	744,610	1,409,600	100.0	100.0
Age				
15 or less	11,630	15,110	1.6	1.1
15–19	232,440	418,790	31.2	29.7
20–24	240,610	489,410	32.3	34.7
25–29	129,600	265,990	17.4	18.9
30–34	72,550	134,280	9.7	9.5
35–39	40,960	65,350	5.5	4.6
40 or more	16,820	20,670	2.3	1.5
Race				
White	548,790	969,410	73.7	68.8
Black and other	195,820	440,190	26.3	31.2
Marital status				
Married	216,210	330,630	29.0	23.5
Unmarried[1]	528,400	1,078,970	71.0	76.5
Number of living children				
0	375,240	798,070	50.4	56.6
1	137,400	271,270	18.5	19.2
2	102,160	198,050	13.7	14.1
3	61,650	83,290	8.3	5.9
4	33,680	} 58,920	4.5	} 4.2
5 or more	34,480		4.6	
Prior induced abortions				
0	n.a.	994,520	n.a.	70.5
1	n.a.	315,480	n.a.	22.4
2	n.a.	71,860	n.a.	5.1
3 or more	n.a.	27,740	n.a.	2.0
Weeks of gestation				
8	284,280	707,750	38.2	50.2
9–10	221,550	388,370	29.7	27.6
11–12	130,630	187,730	17.5	13.3
13–15	44,360	63,130	6.0	4.5
16–20	53,340	50,720	7.2	3.6
21 or more	10,450	11,900	1.4	0.8
Method				
Curettage[2]	667,720	1,338,930	89.7	95.0
Saline infusion	66,610	50,540	8.9	3.6
Hysterotomy/hysterectomy	4,120	1,260	0.6	0.1
Other[3]	6,160	18,870	0.8	1.3

[1] Never married, separated, divorced, widowed.   [2] Suction and dilatation and curettage; also includes D&E (dilatation and evacuation at 13 weeks' gestation and later).   [3] Includes prostaglandin, urea.   n.a. = not available.

SOURCE: Henshaw et al., 1981a; reprinted by permission.

short-term, general, non-Catholic hospitals that could provide local abortion services. Without such service, or abortion services from private physicians, women in these areas had to travel to other counties for abortions.

The necessity to travel is less now than in 1973 when one-fourth of all women obtaining abortions had to travel to another state. Still, in 1978, an estimated 113,000 women who obtained abortions traveled outside their home states to obtain abortion services, and many women who had abortions in their home states did so outside the county where they lived.

When the distance is considerable, the necessity of travel raises financial and logistic barriers that have been shown to lead to lower utilization of abortion by women in need, especially teenagers, nonwhites, and poor women who live in areas with no abortion services. For those who do obtain abortions, the necessity for travel may entail a greater health risk if extra time needed to

obtain an abortion delays the procedure to a later, riskier period of gestation. Distance also makes rapid diagnosis and treatment of postabortion complications difficult.

Experience with legal abortion in some parts of the country since 1967 and throughout the United States since 1973 suggests that services will continue to be most heavily concentrated in metropolitan areas, where there is a large enough population base to support abortions in specialized clinics, and that continued expansion to less densely populated, rural areas will be very slow. Although the problems of accessibility of abortion services, the continued public debate about the issue of abortion in general, and the restriction on the use of public funds to pay for abortions for poor women have clearly limited access to abortion services for some women, legal abortion is widely used in the United States.

Jacqueline Darroch Forrest

See CONTRACEPTIVE USE, *articles on* UNITED STATES OVERVIEW *and* UNITED STATES SINCE 1970: FAMILY PLANNING PROGRAMS, *article on* UNITED STATES.

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ACTUARIAL METHODS

Because actuarial methods are concerned with human mortality, they overlap in many ways the familiar life table of demography [*see* LIFE TABLES]. Actuarial work is, however, particularly concerned with precise methods of interpolation and graduation, with detailed probabilities of individual and joint survival, and with financial calculations for life insurance applications.

The foundations of the subject, like those of all life table work, are considered to date from John Graunt's 1662 analysis of the London Bills of Mortality and Edmund Halley's Breslau table [*see* MATHEMATICAL DEMOGRAPHY]. Of special interest are the attempts since then to discover "laws" of mortality or at least simple formulas that fit closely the curve for the proportion of a birth cohort who survive to each age. This quantity (the l_x column in the life table) was studied first by Abraham de Moivre, who in 1724 suggested that the fall-off of survivors be represented simply by a straight line with a downward slope, but only for the age range from about 12 to 86. This was improved upon by Benjamin Gompertz, who in 1825 proposed a formula with a double exponent that gave a much closer fit to observed curves, even though it required more laborious calculation. The intuitive basis was to assume that people's resistance to death declined geometrically, so that during any portion of time a person lost a fixed proportion of the resistance still remaining at the start of the interval. The proposed formula can be fitted closely to a great range of actual curves, and Gompertz applied it to the l_x function from about age 10 or 15 to age 55 or 60. The formula is

$$l_x = kg^{c^x},$$

where x is age and values must be supplied for the constants g and c. The value for k is l_0/g, taking l_0 from the life table.

A better fit was obtained in 1860 by William Makeham, who took account not only of the increasing force of mortality with age but also of a general chance factor that applied without regard to age. Gompertz had recognized both but had included only the former in his formula. Makeham's equation is

$$l_x = ks^x g^{c^x}$$

with k as above, where x is again age and values must be decided for the constants g, c, and s. This formula can often be applied from about age 20 to nearly the end of life. Both the Makeham and Gompertz formulations continue to be used even today for special purposes.

Because mortality as actually observed is subject to all the crudities of measurement, actuaries have long wanted to smooth the empirical rates so as to approximate the underlying curve. Technical means for this include graphical methods, summation and adjusted-average methods, graduation by mathematical formulas, reference to standard tables, and the use of spline functions (Miller, 1946, presents and compares these means; see also Benjamin and Haycocks, 1970; see Shryock, Siegel, et al., 1975, vol. 2, pp. 681–702, for methods of interpolation). While highly elaborate procedures have been developed, a strong judgmental element nevertheless governs the choice of methods for each data set and investigative purpose.

The examination of life contingencies carries actuaries into survival probabilities considerably more extensive than those usually pursued in demographic work. Because of life insurance and annuity applications, it is necessary to know the probability of survival to any future age from any present age separately for subclasses of the population and to enter into questions of ages at death for married pairs and other groupings of individuals. "Single-life" probabilities pertain to the first and "multi-life" probabilities to the second, allowing, for example, calculation of the chance that, if a married couple are at certain ages now, the husband will die first, and at a particular age, and the wife will survive him by a stated number of years. Other refinements use multiple-decrement tables, to estimate the contingency, for example, that a bachelor now aged 25 will either marry or die by age 30. All these calculations fall into types, for which detailed formulas are set forth.

An interesting feature of life insurance applications is the "select" table. Insurance policies are seldom issued without certain selection criteria, based for example upon health status. Because the newly insured have just passed these tests, their death rate in the next year is typically less than others of the same age who were first insured, say, two years ago. This creates the oddity that the probability of death within the insured group is related not only to age but also to the interval since the policy was created. The recency of selection affects the rates. A further illustration is that of the probability of remarriage among widows, which is related to age and to the interval since husband's death. Relatively low in the first year of widowhood and high in the next, it descends thereafter, until after the fifth year it varies little and can be predicted sufficiently from the woman's age alone. Thus a 2×2 table is created, in which the information by duration since husband's death is the "select" portion and the part after the fifth year is simply combined as five or more and is termed the "ultimate" column. In both illustrations, that for death and that for remarriage, the risk of the event is related not only to normal aging but independently to the duration since a selective event.

Actuarial work is intimately bound up with financial calculations. One such calculation might answer the question "If a thousand persons at various ages are insured for life, what annual rates must be charged to cover the predicted pay-out, considering the interest to be earned on the accumulating premiums on the one hand and the company's expenses on the other?" Possible answers depend on whether the policies are term, declining term, endowment, and so on (Jordan, 1975). Calculations that relate to payment upon a death involve formulas distinct from annuities, which relate to payment during survival. From all these separate purposes and

refinements a highly quantitative discipline has evolved, which has contributed greatly to demographic insight and which serves as the foundation of the life insurance industry.

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ADOLESCENT FERTILITY

In recent years teenage childbearing has received increased attention in both the developed and the developing world, and much has been written on its causes. In addition, there has been a growing awareness of the demographic, health, psychological, and social consequences of teenage fertility to both mothers and children.

Trends. In both the United States and developing countries, adolescent fertility has declined, but there is still cause for concern.

United States. Birth rates for U.S. women 20 years of age and older fell sharply during the past decade. Although birth rates among those aged 18–19 also declined, teenage fertility continues to cause concern because birth rates for younger teens have not fallen. Table 1 indicates that between 1967 and 1977 the birth rate for those aged 18–19 fell from 117.4 births per 1,000 women to 81.9. The birth rate among those aged 15–17, however, remained quite stable during that period, and the rate

TABLE 1. *Birth rates for women 10–19 years of age, by age of mother and race: United States, 1967–1977*[1]

Age of mother and race	1977	1975	1974	1973	1972	1971	1970	1969	1968	1967
10–14 years										
Total	1.2	1.3	1.2	1.3	1.2	1.1	1.2	1.0	1.0	0.9
White	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.3
All other	4.3	4.7	4.7	5.0	4.7	4.7	4.8	4.6	4.4	4.1
Black	4.7	5.1	5.0	5.4	5.1	5.1	5.2	4.9	4.7	4.4
15–17 years										
Total	34.5	36.6	37.7	38.9	39.2	38.3	38.8	35.8	35.2	35.5
White	26.5	28.3	29.0	29.5	29.4	28.6	29.2	26.4	25.7	25.8
All other	76.6	82.0	86.2	91.6	94.5	94.3	95.2	93.4	94.1	95.2
Black	81.2	86.6	91.0	96.8	99.9	99.7	101.4	97.3	98.9	100.0
18–19 years										
Total	81.9	85.7	89.3	91.8	97.3	105.6	114.7	115.0	114.9	117.4
White	71.1	74.4	77.7	79.6	84.5	92.4	101.5	101.5	102.0	104.9
All other	141.9	150.1	156.4	163.7	175.2	187.0	195.4	197.9	196.6	200.0
Black	147.6	156.0	162.0	169.5	181.7	193.8	204.9	202.9	201.3	205.2

[1]Rates are live births per 1,000 women in specified group. Data for 1976 are unavailable.
SOURCE: Ventura, 1977.

among the youngest teenagers rose steadily from 0.9 births per 1,000 women to 1.2. In both 1967 and 1977, births to teenagers comprised 17.2 percent of all U.S. births.

In terms of absolute numbers, live births to teenagers declined from 605,030 in 1967 to 570,609 in 1977. However, as may be seen in Table 2, the decline is solely a result of the reduction of births to those aged 18–19. During the ten-year period, the number of babies born to teenagers of 15–17 increased by 13.6 percent, while the number among those 10–14 increased by 33.3 percent. Of note, however, is that since 1973 both birth rates and

total live births have declined even among the two youngest groups.

Tables 1 and 2 also document racial differences in birth rates and total live births among U.S. teenage women. Birth rates for black teenagers were consistently higher than those for white teenagers. Between 1967 and 1977 white absolute births increased by 69.2 percent among those aged 10–14 and by 16.9 percent among those aged 15–17. Among blacks, there were smaller increases of 14.6 percent among those aged 10–14 and 4.5 percent among those aged 15–17.

A further cause of new interest in teenage fertility is

TABLE 2. *Total live births for women 10–19 years of age, by age of mother and race: United States, 1967–1977*[1]

Age of mother and race	1977	1975	1974	1973	1972	1971	1970	1969	1968	1967
10–14 years										
Total	11,455	12,642	12,529	12,861	12,082	11,578	11,752	10,468	9,504	8,593
White	4,671	5,073	5,053	4,907	4,573	4,130	4,320	3,684	3,114	2,761
All other	6,784	7,569	7,476	7,954	7,509	7,448	7,432	6,784	6,390	5,832
Black	6,582	7,315	7,291	7,778	7,363	7,264	7,274	6,650	6,312	5,742
15–17 years										
Total	213,788	227,270	234,177	238,403	236,641	226,298	223,590	201,770	192,970	188,234
White	138,223	148,344	152,257	153,416	150,897	143,806	143,646	128,156	121,166	118,035
All other	75,565	78,926	81,920	84,987	85,744	82,492	79,944	73,614	71,804	70,199
Black	71,182	74,946	77,947	81,158	82,217	79,238	76,882	71,020	69,594	68,133
18–19 years										
Total	345,366	354,968	361,272	365,693	379,639	401,644	421,118	402,884	398,342	408,211
White	253,960	261,785	267,895	271,417	283,089	302,920	319,962	306,118	305,336	317,204
All other	91,406	93,183	93,377	94,276	96,550	98,724	101,156	96,766	93,006	91.007
Black	84,008	86,098	86,483	87,615	90,132	92,446	94,944	90,918	87,986	86,410

[1]Data for 1976 are unavailable.
SOURCE: Ventura, 1977.

that while young adolescents have exhibited rises in births and birth rates, their marital fertility has actually declined. Between 1966 and 1975, the marital birth rate decreased by 25 percent among women aged 15–17. Even among those aged 18–19 the decline was 34 percent. In contrast, the out-of-wedlock birth rates per 1,000 unmarried women increased for both age groups. Consequently, in 1966 about 35 percent of all births to those 15–17, and 16 percent of births to those 18–19 occurred out of wedlock. By 1975, those figures had become 51 and 30 percent respectively. Here too, racial differences are notable. In 1975 for example, among the younger group, about 33 percent of births to whites, and 87.4 percent of births to blacks were out of wedlock, while among the older group, the percentage of such births was 17.2 for whites and 67.6 for blacks.

Although out-of-wedlock fertility is often equated with unintended fertility, some out-of-wedlock births among teenagers are intentional, and not all marital births are intended. Recent estimates suggest that only 51.1 percent of the births to U.S. teenagers are intended. Further, among black teenagers the proportion of births that are unintended is substantially greater than among whites.

Developing countries. It is difficult to identify trends in adolescent fertility rates in the developing world for two reasons. First, there are problems of availability, recency, and accuracy of age-specific birth data. Second, those rates that have been calculated are better characterized by their heterogeneity than their similarity across countries or regions.

Table 3 shows the range of teenage fertility rates in 1975 or the most recent years, for selected countries of the five continents. At the lowest end of the spectrum within the nonindustrialized developing world are Egypt and Cyprus, which have teenage fertility rates comparable to or lower than those of western Europe. At the intermediate level, several developing countries have rates similar to the U.S. rate (e.g., Mauritius, the Philippines, Guadeloupe, and Uruguay). At the highest end of the spectrum are several countries in Africa and Central America, with rates of more than 130 per 1,000.

Regardless of whether adolescent fertility in developing countries falls into the low, moderate, or high ranges, a comparison of rates in 1960 and 1970 reveals almost universal declines. These changes parallel the trend toward overall fertility declines in developing countries. In general they are the result of later marriage and emerging alternatives to familial roles for women.

Another way of viewing adolescent fertility is to report births to women aged 15–19 as a percent of the total births within a country. By this measure, adolescent fertility makes a greater contribution to the total number of live births in the United States and parts of Eastern Eu-

rope than it does in most developing countries. Further, births to adolescents account for a relatively small proportion of births in most countries; less than 15 percent in the majority of cases. If the fertility of women over age 20 declines faster than adolescent fertility, then this proportion will increase over time, as it has in the United States. This has happened in some developing countries, but it is difficult to identify a general trend.

Despite the general decline in teenage birth rates, adolescent fertility is perceived as a problem in many parts of the developing world for several reasons. First, the decline in teenage births is often from dramatically high to moderately high rates. Second, the age structure of many developing countries makes the problem more visible. A high proportion of persons under age 20 makes even moderately high birth rates within this age group a cause for concern. Third, a youthful population with even moderately high birth rates can be expected to lead to rapid subsequent population growth as teenage cohorts mature.

Determinants. In the United States, declines in fertility among older women, and the increased availability and use of both family planning and abortion services among teenage women, raise questions about the reasons for a slower decline in teenage fertility, especially since about half of births to teens are unintended. Of concern also are the increases in fertility among younger teenagers.

The immediate causes of early childbearing are, of course, quite simple. Conceptions among teenagers result from early and unprotected intercourse. If teenagers do not choose abortion and do not miscarry, they give birth. In order to uncover the underlying determinants of adolescent fertility, it thus becomes necessary to examine the correlates of teenage intercourse and the use of contraception and abortion.

Recent studies in the United States have documented an increase in the proportion of women aged 15–19 ever having sexual intercourse from 27 percent in 1971 to 35 percent in 1976 (Zelnik and Kantner, 1977). Intercourse has been found to be more prevalent among older teenage women and among women who are less educated and hold negative attitudes toward education. There is also a positive correlation between women having sexually permissive friends and women having sexual intercourse, suggesting that peers influence sexual behavior. A few studies have indicated that psychological characteristics such as low levels of self-esteem, risk-taking attitudes, and greater passivity or dependence are related to adolescent intercourse. Although the proportion of women ever having intercourse is higher among black than white teenagers, this may be the result of socioeconomic differences (Chilman, 1978).

Along with increased sexual activity among U.S. teen-

TABLE 3. *Age-specific fertility rates of women aged 15–19 for selected countries*[1]

Continent	Less than 40	40–69	70–99	100–129	130 or more
Africa	Egypt Tunisia	Burundi Mauritius Reunion	Botswana Comoros Morocco Namibia	Algeria Ghana Swaziland Zambia	Benin Cameroon Chad Congo Ethiopia Gabon Ivory Coast Kenya Liberia Madagascar Mali Mauritania Niger Nigeria Senegal Seychelles Tanzania Togo Uganda
Asia	Cyprus Hong Kong Japan Singapore South Korea Sri Lanka Taiwan	Brunei Iran Israel Philippines Turkey West Malaysia	India Jordan Syria Thailand	Afghanistan Gaza Strip Indonesia Iraq Kampuchea Kuwait Pakistan	Bahrain Bangladesh Nepal
Oceania		American Samoa Australia Fiji New Zealand		Guam	
America	Canada Panama Canal Zone	Argentina Guadeloupe Haiti Martinique United States Uruguay	Bahamas Barbados Bermuda Bolivia Brazil Chile Colombia Ecuador Guyana Mexico Peru Puerto Rico Trinidad and Tobago	Costa Rica Cuba Dominican Republic Greenland Grenada Nicaragua Panama Paraguay U.S. Virgin Islands Venezuela	Belize Dominica El Salvador Guatemala Honduras Jamaica St. Lucia St. Vincent
Europe	Albania Belgium Denmark Finland France Ireland Italy Luxembourg Malta Netherlands Poland Portugal Soviet Union Spain Sweden Switzerland West Germany	Austria Channel Islands Czechoslovakia East Germany Faeroe Islands Gibraltar Greece Hungary Iceland Norway Romania San Marino United Kingdom Yugoslavia	Bulgaria		

[1] Rates are births per 1,000 women aged 15–19.
Source of data: United States, Agency for International Development, 1977.

agers, the use of more effective contraceptive methods has also increased. However, the majority of unmarried, sexually active, adolescent females consistently engage in unprotected intercourse, or only sometimes use contraception, thereby subjecting themselves to the risks of pregnancy and early childbearing. Until recently, access to contraceptive services for adolescents in the United States was severely limited. Although such services have become much more available during the past decade, service-related circumstances, such as confidentiality, clinic location, visibility of the service, cost, waiting time, and the attitudes of providers, still appear to affect adolescents' use of these services. Studies have also shown that adolescents often underestimate the probability of pregnancy, which may help to account for their lack of contraceptive use.

Many studies have explored the social and psychological characteristics of adolescents who use or do not use contraceptives. Women who are younger, black, Protestant, or from lower-class families have all been found more likely to be inconsistent users of contraception or not to use it at all. Teenage women who have never been pregnant, who are having intercourse sporadically, and who are not in a steady or committed dating relationship are also less likely to be regular users of contraception.

Since the 1973 U.S. Supreme Court decision regarding abortion, many teenagers have elected to terminate their pregnancies. Between 1972 and 1975, for example, the abortion rate rose from 21.3 to 31.6 per 1,000 women aged 15–19. The ratio of abortions per 1,000 live births to women aged 15–19 was 562 in 1975. Several studies comparing abortion users with those who carry to term indicate that those who select abortion are more likely to have used contraception, to have high educational aspirations, and to come from middle-class or higher socioeconomic backgrounds (Chilman, 1978).

In developing countries, adolescent fertility rates are affected by variations in levels of physical and social maturation of young people. The average age at menarche in developing countries varies from 12 to 15, or is even later among malnourished populations. Despite these differences, there is a general tendency toward earlier physical maturation and later marriage in these nations. The result of these combined trends has been prolongation of the period of risk of premarital births.

Whether or not prolonged periods of adolescent fecundity result in increases in adolescent fertility depends, in part, upon the severity of sanctions regarding premarital sex. In countries where premarital intercourse is proscribed, even low rates of out-of-wedlock births to teenagers contribute to the perception of adolescent fertility as a serious problem. An increase in illegitimacy rates among young people has been noted in many areas, and is sometimes attributed to the effects of urbanization on traditional family structures. As increasing numbers of young men, and more recently young women, migrate from rural areas to cities in search of work, the influence of the nuclear family is weakened. This phenomenon appears to bring with it a period of social, as opposed to biological, adolescence, in which new values are assumed and traditional mores weakened. In some parts of the world, however, teenage childbearing prior to marriage may conform to, rather than deviate from, traditional values. In areas of Africa and the Caribbean, for example, proof of fecundity by early childbearing may enhance a woman's prospects for marriage or consensual union.

Consequences. There is now a substantial amount of research on the consequences of early childbearing in both developed and developing nations. This research may be grouped in six major categories: (1) demographic consequences, (2) obstetrical consequences, (3) health consequences for the infant, (4) social consequences for the mother, (5) psychological consequences to the mother, and (6) consequences for the development of the children. The major findings in each of these areas will be reviewed briefly.

Demographic consequences. The onset of childbearing in the teenage years is associated with shorter intervals between births and greater cumulative fertility. For women who begin childbearing earlier, this means a larger number of children closely spaced together, and potential household crowding. On a national level, this translates into higher rates of population growth, larger average size of completed families, and a younger population.

Obstetrical consequences. In both developed and developing countries, young mothers are at greater risk than older mothers of various complications of pregnancy and childbirth. These include hypertension, toxemia, preeclampsia, eclampsia, postpartum hemorrhage, Caesarean section, forceps deliveries, and maternal mortality.

Research comparing these risks among older and younger women shows a consistent advantage to women in their twenties, as compared to teenagers and women over age 35. Studies have also indicated that the risks to the youngest mothers can be reduced with proper nutrition and good prenatal care. In this latter group of studies are some that indicate no differences in obstetrical complications to adolescents or women in their twenties, or even an advantage to teenage women, provided that good prenatal care is obtained. In developing countries, risks to younger women are particularly high because the greatest number of early births occur in rural or economically deprived areas, where access to good medical care is most limited.

Health consequences for the infant. Comparative studies of children born to mothers of different ages have shown

consistently higher risks for the infants of adolescent mothers. These risks include low birth weight, prematurity, infant morbidity and mortality, and lower Apgar scores, which indicate stability and general health of the infant at birth. However, as in the research on obstetrical risks to mothers, there is evidence that these risks can be lessened or eliminated by good prenatal care.

Social consequences. The social outcomes of adolescent pregnancy vary tremendously among nations. They depend heavily on whether early births reflect normative or deviant behavior and whether they occur within or outside of marriage. In developed nations, adolescent fertility often results in interrupted schooling and in early marriage. Further, early marriages are associated with higher rates of divorce, particularly when the marriages are precipitated by out-of-wedlock pregnancies. Other social consequences of adolescent fertility in the United States include lower rates of participation in the labor force and reduced socioeconomic status.

For each of these consequences, there is some indication that the apparent effects of age are diminished when the factor of socioeconomic status is kept constant. Since adolescent pregnancy rates are highest in developed countries among women of low socioeconomic status, such control is important in order to separate the impact of early fertility itself from that of the social conditions that may have contributed to it.

There have been few studies in developing countries to indicate whether the U.S. association between adolescent fertility and reduced social status obtains. The pattern may well be different in areas where school desertion rates are highest prior to puberty, and where women derive status from early assumption of the maternal role.

Psychological consequences to the mother. Research on the psychological consequences of adolescent pregnancy has focused on the effects of early childbearing on the completion of the developmental tasks of adolescence. Such research has been conducted almost exclusively in developed countries, where the period socially defined as adolescence is long, and is associated with a variety of cultural expectations. In developing countries, where young people move quickly from the status of child to adult, a distinct period of adolescence is not as clear cut.

Moreover, research concentrating on psychological consequences has yielded inconclusive results. While some authors have argued that adolescent fertility impedes normal psychological development, others have maintained that the increased responsibilities of child-care offer positive opportunities for maturation.

Consequences for child development. In the area of child development, too, more research exists in developed than in developing countries. It is not clear, however, whether or not the children of adolescent mothers suffer disadvantages. While some evidence suggests that these children are less healthy and are more likely to be separated from their biological parents, other studies indicate that the motor development, the health, and the social and language abilities of children born to adolescent mothers are equal to those of children born to older mothers. Similarly, intelligence quotient (IQ) appears to be more strongly related to the social and economic background of the family than to the age of the mother.

In summary, the clearest consequences of adolescent fertility are the demographic outcomes. Early childbearing is consistently associated with shorter birth intervals and higher cumulative fertility. While the obstetrical, health, and social risks to mothers and their children are formidable, these appear to be lessened by good prenatal care and by equalization of socioeconomic status. Finally, the psychological and developmental consequences to young mothers and their children are unclear.

This mixed picture does not mean, however, that adolescent fertility is not a cause for concern. While we might introduce statistical control for receipt of prenatal care or socioeconomic status, it is not so simple to distribute these advantages equally to younger and older mothers. Consequently, prevention or lessening of adolescent fertility remains a worthwhile goal. In recognition of this, programs for adolescent parents and their offspring have become a priority in many countries.

Strategies to limit adolescent fertility have included the proscription of premarital intercourse, the provision of contraceptive services for teenagers, and the alteration of sex role stereotypes that encourage sexual activity for males but forbid it or promote passivity among females. Once a teenager is pregnant, many persons have recommended the easy availability of abortion and prenatal care to reduce negative outcomes. Finally, in order to reduce the negative consequences for young parents, programs have stressed return to school, provision of child care, job training, parenting skills, and contraceptive education and services to prevent rapid repeat pregnancies.

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See also AGE AT MARRIAGE; CONTRACEPTIVE USE; EDUCATION, *article on* SEX EDUCATION; LAW AND FERTILITY REGULATION.

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AFRICA

See NORTH AFRICA AND SOUTHWEST ASIA; SUB-SAHARAN AFRICA.

AGE AT MARRIAGE

Throughout the world, women who marry late, in their middle or upper twenties, tend to have fewer children than women who marry early. In Europe since the beginning of the modern era, in Japan during the first half of the twentieth century, and in a number of other Asian countries for the last three decades, delayed marriage has had an important effect in limiting population growth. Today age at marriage is less important than it used to be in determining how many children a couple will have because, on a worldwide basis, deliberate use of methods of birth control has become the single most important factor in determining family size.

Early marriage produces more children for at least three important demographic reasons. If women marry young (1) they are likely to have sexual intercourse frequently throughout their most fecund years; (2) they begin having sexual intercourse at an earlier age and thus live through a longer period of exposure to concep-

tion; and (3) they shorten the interval before the next generation is born and begins childbearing. Each of these factors means more rapid population growth. Moreover, women who marry young tend to have less education and less opportunity to take on jobs or roles other than motherhood. Bearing and raising children then become the major source of their status in the family and community. This lowers their incentive to limit family size.

The effect of late marriage on fertility may be limited by deliberate use of contraception and abortion to control fertility, regardless of marital status; by different definitions of marriage (hence of age at marriage) in different cultures; and by the greater probability of sexual activity and pregnancy before marriage as the age of marriage rises, a factor that varies in different cultures. A number of other demographic qualifications and socioeconomic conditions influence fertility differently at various ages, both within and outside marriage.

Thus, it becomes clear that the relationship between age at first marriage and fertility is not so simple. Comparing age at first marriage and subsequent fertility means evaluating the impact of a single social and cultural event on a series of biological events. If sexual activity begins before marriage, however, it becomes difficult to make a clear evaluation. Also, analysis often assumes that marrying later merely postpones a woman's pattern of childbearing without otherwise changing it. But if patterns of childbearing change because fertility is deliberately controlled, or because childbearing before marriage increases among women who marry late, or because less widowhood, divorce, and separation among women who marry late increases their opportunities for intercourse, then the relationship between nuptiality and fertility trends is even less obvious. These two problems, the relationship of marriage to sexual exposure and the differences in the reproductive behavior of those who marry at different ages, are major demographic issues in assessing current patterns and trends in age at marriage and fertility.

One way to gauge roughly the contribution of postponed marriage to declining fertility rates is to compare the changes in fertility rates among younger women with the changes in fertility rates among older women. Presumably most of the declines in fertility among younger women are due to later marriage and most of the declines among older women are due to use of contraception, although some unmeasured proportion of the reduction in early births may also be the result of contraception and abortion and some of the fertility decline among older women could be the result of separation of spouses through migration and of greater marital instability.

Developed Countries. At the end of the eighteenth century, both late marriage and a high proportion of

unmarried people had long been characteristic of western Europe. During the nineteenth century and earlier nearly 70 percent of the women in western Europe remained unmarried in their early twenties but less than 5 percent never married. In fact, a line could be drawn roughly from Leningrad to Trieste dividing European populations into those having a pattern of late marriage and lower fertility in the west and those having a pattern of early marriage and higher fertility in the east. Ireland is frequently cited as the extreme case of a society in which, even though methods of voluntary contraception were almost totally absent, population declined sharply in the late nineteenth and early twentieth centuries in part because a high proportion of the population married late or not at all.

Several reasons for this remarkable western European pattern of late marriage have been suggested. The most widely advanced explanation is the stem-family tradition going back at least to the sixteenth century. Essentially, in a stem-family system, primogeniture prevails. Only one son inherits the family land, and he must wait to marry until his father dies or is ready to make arrangements so the son can marry and support his own family on that land. As life expectancy increases, marriage may be postponed even further. This pattern of stem-family inheritance and small landholding combined with the economic pressures of a growing population to control marital fertility through delayed marriage rather than through conscious motivation.

This situation changed in the latter half of the nineteenth century, when a number of other factors, both indirect and direct, began to affect both age at marriage and marital fertility. Factors indirectly affecting fertility were new farm technology, which reduced the value of children as farm laborers; urbanization, which crowded people and hastened the spread of new ideas and practices; industrialization, which produced jobs outside the home for women as well as men. Other influential factors were opportunities for more education for both sexes, which increased both the age at which those seeking education would marry and the cost of children who would later have to be educated; and, finally, increased migration, which created imbalances in sex ratios in many areas.

Even more important, however, the late nineteenth century saw a rapid diffusion through much of western Europe of contraceptive information and products. Birth rates dropped rapidly while marriage rates remained the same or even increased. What had been once a clear and close relationship between marriage and childbearing was altered by the introduction and publicizing of more effective methods of contraception. This, more than any other single factor of socioeconomic change, is now thought to be the major reason for the decline in fertility levels in Europe.

In fact, the proportion of people married has increased since the mid-nineteenth century in much of Europe and the age at which marriage usually takes place has declined for both men and women. At the same time, marital fertility rates have dropped to some of the lowest levels ever recorded.

Nevertheless, while age at marriage and the subsequent tempo of childbearing are not as closely linked in the developed countries as they were in the past, age at marriage still remains a determinant of completed fertility. In the United States, for example, National Fertility Survey data show that both wanted and unwanted fertility are higher among women who marry at an earlier age. In Great Britain, the United States, and Australia, those who marry before age 20 have, on the average, one child more than those who marry after 25. This relationship between high fertility and early age at marriage diminishes but does not disappear even when education, husband's occupation, farm background, and religion are taken into account.

Some of the obvious influences on age at marriage, such as child marriage, education, and job opportunities, may be susceptible to change by deliberate government policies, but others may be deeply rooted in individual and cultural differences that are not easily altered by laws or government policies. Thus, within a society, age at marriage may continue to be an important predictor of individual fertility no matter what changes are observed in aggregate fertility rates for the whole society.
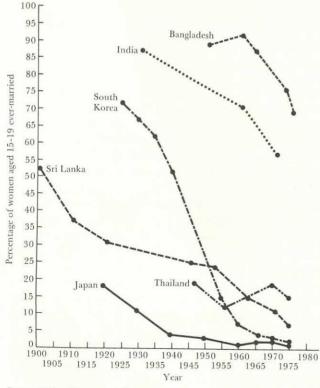
Asia. In Asian countries where women marry late total fertility is low; where they marry early it is relatively high. The trends that have brought this relationship about, however, have not always occurred simultaneously. In some countries substantial rises in age at marriage took place in the first half of the twentieth century apparently without marked drops in total fertility, which began after 1950. Through the early 1960s, lower fertility among young women, associated with later marriage, contributed substantially to total fertility declines. More recently, as family planning programs have grown and fertility has dropped more rapidly, lower fertility among older women, most of whom are married, has accounted for more, and usually most, of the total fertility decline.

Prevalence of early marriage. A comparison between age at marriage and fertility rates in 1980 shows that the countries of Asia range from patterns of early marriage and high fertility to patterns of late marriage and low fertility. Looking at Asia as a whole, the mean total fertility rate for countries where few women marry before age 20 is near 3, while for countries where many women marry before age 20 it is slightly over 5.

Geographic patterns are apparent. In the Indian sub-continent, except for Sri Lanka, early marriage is the rule and the total fertility rate is high. In Southeast Asia (Burma, Indonesia, Malaysia, the Philippines, and Thailand) except Singapore, early marriage is moderately common and the total fertility rate is moderate. In East Asia (Japan, South Korea, Hong Kong, and Taiwan), early marriage is the exception and the total fertility rate is low. In China, although data are few and controversial, early marriage seems to be extremely rare and birth rates are exceptionally low.

Trends in age at marriage and fertility. An examination of trends in Asia reveals that fertility can remain high even when women are marrying later. Rising age at marriage has been documented since the early twentieth century in Sri Lanka, Japan, South Korea, Taiwan, and the Philippines (see Figure 1). These increases took place well before substantial declines in fertility. In Japan, for example, by 1920 only about 18 percent of women 15–19 were married, while the total fertility rate was still over 5. In Sri Lanka, by 1953 only about 25 percent of women 15–19 were married, yet the total fertility rate was nearly 6.

FIGURE 1. *Trends in early marriage, selected Asian countries, 1900–1976*

Source of data: Henry and Piotrow, 1979.

Influences on age at marriage. In Asia, as elsewhere in the world, trends toward later marriage and lower fertility have occurred in a context of urbanization and economic and social development. The social conditions that have provided the incentive to control fertility have also provided the incentive to delay marriage.

The association with age at marriage of urbanization, female school enrollment, and female economic activity at age 20–24 is moderately close. In the four countries of Asia with high levels (that is, above the regional medians) for all three socioeconomic factors—Japan, Hong Kong, Singapore, and South Korea—3 percent of women 15–19 are or have been married. In the four countries with low levels for all three factors—Bangladesh, Indonesia, India, and Nepal—57 percent are married. In the four countries where some socioeconomic levels are high and some low—West Malaysia, the Philippines, Sri Lanka, and Thailand—11 percent are married. The three socioeconomic factors are interrelated to such a degree that it is not possible to single out one as more important than others in its relationship with age at marriage.

Fewer early births, whether achieved by late marriage or by contraception, have had impacts of differing importance on declines in total fertility in Asian countries. They have played important roles in certain countries in certain time periods. Close to 40 percent of the overall decline in fertility rates occurred among women 15–24 in West Malaysia from 1960 to 1970, in Sri Lanka from 1953 to 1971, and in Hong Kong from 1965 to 1970. In these countries the decline attributable to women 35 or older during those periods was much lower. Declining fertility among young women also accounted for substantial proportions of the total fertility decline in Hong Kong from 1970 to 1975, in Singapore from 1965 to 1975, and in Indonesia from 1967 to 1975. Fertility among older women in these countries also fell substantially in these periods. By contrast, declines in fertility rates among younger women were of little importance in reducing overall fertility in Thailand from 1965 to 1974, in Taiwan from 1965 to 1975, and in South Korea from 1970 to 1975.

In East Asia, later marriage and fewer early births were most important in the initial years of the transition to low fertility, but less important in later years when more of the total fertility decline was attributable to lower fertility among older women.

In Asian countries where total fertility has dropped appreciably, the fertility rate of each five-year age group, as a proportion of the total fertility rate, has remained about the same. In other words, the rates of fertility decline have been roughly equal in all age groups, even though the absolute declines among older women have

been larger. If anything, the relative contribution of women under age 25 to the total fertility rate has increased somewhat in a majority of these countries from the 1960s to the 1970s. That is, fertility has declined at a slightly slower rate among young women than among older women. This is true in India, Indonesia, Japan, South Korea, Singapore, Taiwan, and Thailand. By contrast, in Bangladesh, Hong Kong, Malaysia, the Philippines, and Sri Lanka, fertility declined somewhat faster among younger women than among older women.

A closer look at Korea, where the age at marriage has increased and fertility has declined, shows that the age at marriage increased steadily until 1960 with very little effect on fertility. Many specific factors were responsible for the rising age at marriage. First, marriageable young men migrated both internally, from rural to urban areas, and externally, to Japan and Manchuria. Later, World War II and the Korean War disrupted Korean society. All able-bodied young men were conscripted during the Korean War, and mandatory three-year military service in South Korea since then has continued to discourage early marriage.

Changes in education and employment have also encouraged later marriage. Since the end of World War II, education has been extended to many more men and, for the first time, to women. At the same time, manufacturing jobs have become available in the cities, providing some jobs for young unmarried women. Since an unmarried woman's income often goes to her family, her parents may encourage her to marry late so that the family can continue to receive support. An unmarried man must work long enough to be able to support his wife and children once he marries. Thus both women and men have economic reasons to marry late.

In the 1960s, with the start of a strong family planning program, the total fertility rate fell from more than 6 to less than 4. The fertility rate for women 20–24 fell by almost 30 percent between 1960 and 1975. Use of contraception in Korea tripled between 1964 and 1973, from 10 to 30 percent, and the incidence of abortion in the capital city of Seoul more than doubled during the 1970s. The use of fertility control measures, both within and outside of marriage, was therefore directly responsible for the sharp drop in fertility during the 1960s and the 1970s.

Middle East. In the Muslim Middle East, bounded by Pakistan on the east, Turkey on the north, the Sudan on the south, and Morocco and Western Sahara on the west, early arranged marriage remains common; it is part of the Islamic tradition of the seclusion of women, or purdah. In this region, eighteen countries have data on age at marriage and twenty on total fertility. These countries occupy an intermediate position between the pattern of late marriage and low fertility that prevails in

East Asia and the pattern of early marriage and high fertility that prevails on the Indian subcontinent. As in Asia, fertility rates are higher where early marriage is most common and lower where marriage is delayed, but the relationship is less pronounced than in Asia.

Social pressures continue to promote early marriage in the Middle East. Families perceive economic advantages in marrying off daughters at young ages; Islamic teachings encourage early marriage; the high value ascribed to female chastity means a suitable match for a girl must be found soon after she reaches sexual maturity; dowry (bride price) is higher for younger women because of sexual attraction and because younger women have higher potential fertility. Although some young couples establish their own homes, many live with the husband's family and young girls are preferred because they can be more easily incorporated into the household. Cross-cousin marriages are favored and are arranged by families while the intended spouses are young.
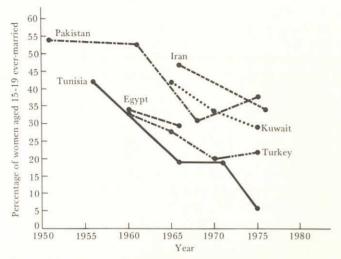
Many Muslims believe that women should not come into contact with men who are not relatives. This belief leads kinsmen to limit severely the activities of women. In rural areas, and in the cities outside the major metropolitan areas, the physical movement of women is highly restricted. Except among the upper and middle classes in large cities, the place of women in Islamic society leaves few alternatives to early marriage.

Prevalence of early marriage. In eighteen Middle East countries with data available, the average percentage of married women aged 15–19 is 34. The range of percentage of women married at young ages varies widely. Early marriage reportedly is least common in Tunisia, with only 6 percent of those aged 15–19 reported married in 1975; Lebanon had 13 percent in 1970; and Turkey had 22 percent in 1975. Early marriage is most common in Libya, Western Sahara, and Afghanistan.

Trends in age at marriage and fertility. Age at marriage has risen recently in eight of the eleven Middle East countries for which trend data are available (see Figure 2). These increases have not always been associated with decreases in total fertility, however. Age-specific fertility rates are available for six of the eight countries—Bahrain, Kuwait, Morocco, Pakistan, Tunisia, and Turkey—and in five of the six, slight decreases in the fertility of women 15–19 confirm the increase in age at marriage from 1971 to 1976, but in Tunisia, paradoxically, the fertility of women 15–19 has increased while age at marriage increased. Questions have been raised about the validity of the age-at-marriage data in Tunisia.

In only four countries is it possible to estimate the contribution of postponed marriage to declining fertility rates by comparing changes in age-specific fertility rates among younger women to changes in fertility rates

FIGURE 2. *Trends in early marriage, selected Middle Eastern countries, 1951–1976*

Source of data: Henry and Piotrow, 1979.

among older women. In three of the countries—Egypt, Tunisia, and Turkey—declining fertility among younger women has not been responsible for most of the drop in the total fertility rate. The declines that have occurred have been primarily among women 25–34 in Egypt and over 35 in Turkey and Tunisia. These declines are almost certainly caused by increased use of contraception and abortion with little change in the proportion married at those ages.

In Bahrain, declining fertility among younger women was responsible for most of the small decline in overall fertility between 1965–1971 and 1971–1976. Some of this decline is directly due to higher age at marriage. In 1965, 59 percent of women 15–19 and 94 percent of women 20–24 were married, figures that dropped to 29 percent and 83 percent, respectively, in 1971. A marriage squeeze, caused by extremely high birth rates before 1970, the custom of men marrying women five to ten years younger than they, and out-migration of men, may have been a major cause of delay in marriage. Although school enrollment for women 15–19 has increased by more than 50 percent since 1965, very few Bahraini women are employed outside their households.

Even in countries where early marriage is becoming less common, there has been considerable resistance to reform of marriage customs. Iran and Tunisia are among the countries where age at marriage clearly has been rising and birth control is more widely used, especially in the cities. The governments of both countries during the 1960s and 1970s tended to encourage later marriage.

Africa. Africa has about the same proportion of women married at age 15–19 as the Indian subcontinent, and the countries of sub-Saharan Africa (excluding

North Africa, southern Africa, and islands off East Africa) have the highest levels of early childbearing of any region in the world. There have been few family planning programs on the African continent south of the Sahara and no evidence of any trends toward lower fertility or changing age at marriage.

Within the region there is little association between early marriage, early childbearing, and the total fertility of countries. While Africa ranks low in female school enrollment and urbanization, it has one of the highest proportions of economically active young women of any region, but neither outside employment nor higher levels of school enrollment appear as closely linked to lower fertility as they are in other parts of the world.

There are three reasons for these disparities. First, many of the African data are old and of poor quality. Also women frequently do not know their exact age and underreport both infant mortality and live births.

Second, the demographic transition is at an earlier stage in Africa than in most other regions. Mortality rates, especially infant mortality, are still high in many areas, and there is little evidence of declines in fertility. Data on trends in marriage and early childbearing are few.

Third, throughout Africa there is great local variation in marriage customs, and consequently in fertility patterns, even within the same country. Influencing these customs in parts of Africa are high rates of infant mortality and a high incidence of infertility and subfecundity. Polygamy often exists side by side with a high rate of widowhood, divorce, and remarriage.

Prevalence of early marriage. In comparison with women from most other regions, African women marry young. According to the most recent available data from twenty-eight countries, the average proportion of married women aged 15–19 was 55 percent, close to the 58 percent in the Indian subcontinent. Fertility rates among women in this age group are also high, averaging 164 births annually per 1,000 women aged 15–19 in thirty-one countries where data are available.

Marriage is nearly universal in Africa. While almost every woman marries at least once in her lifetime, the prevalence of early marriage varies widely from country to country and even from one area to another within African countries. Marriage close to the age at menarche is common in most Islamic areas—for instance, the Sahel states of Mali, Chad, Niger, and Mauritania, and the northern region of Nigeria.

In general, early marriage may be less prevalent in East and Central Africa than in West Africa. The median age at marriage is at least 17 or the proportion of women married at age 15–19 is less than 50 percent in Angola, Botswana, Burundi, western Cameroon, Ghana, Kenya,

Liberia, western Nigeria, Rwanda, Somalia, Tanzania, Upper Volta, Zaire, and Zambia.

In areas where fertility is usually controlled only by abstinence and breastfeeding, differences in the age at which sexual activity begins (roughly indicated by usual age at marriage) should have a noticeable effect on overall fertility. Indeed, it has been argued that variation in abstinence within marriage is one of the major factors accounting for variations in fertility in Africa, so differences in the length of abstinence preceding marriage could be expected to have an impact.

Data from twenty-seven countries for which estimates from comparable periods are available, however, show no association between the prevalence of early marriage and total fertility rates. The twelve countries where less than half of the women 15–19 are married have an average total fertility rate of 6.5, a rate slightly higher than the average for the fifteen countries where half or more are married at age 15–19. Using age-specific fertility among young women as a check on the validity and consistency of age-at-marriage data, when countries with both a high rate of early fertility and a high rate of early marriage are contrasted with countries where both rates are low, there is still no meaningful differences in total fertility rates. Countries above the median in percentage married and age-specific fertility for women 15–19 have an average total fertility rate of 6.4, while countries low on both measures have an average of 6.7.

Infertility, polygyny, and marital instability. Several characteristics of African marriage and fertility patterns may explain why, at the national level, age at marriage appears to be unrelated to total fertility. While some aspects of African life encourage both early marriage and high fertility (high infant mortality, for example) other aspects tend to encourage early marriage but do not necessarily encourage high overall fertility. Chief among these are involuntary infertility and marriage patterns that include high rates of polygyny (the practice of having more than one wife), separation, divorce, and widowhood.

Education. Socioeconomic factors are probably beginning to have a greater influence on African fertility, but the impact of education, employment, and urbanization is not so clear-cut as in other parts of the world. For example, African women who have attended school tend to marry later than women who have never been to school, but fertility levels are not always related to school attendance. In many places, women with primary-level schooling have more children than either those with no education or those who have gone to secondary schools or universities. This may be because primary school attendance is often associated with better living conditions and less adherence to the traditional practice of abstinence

for several years after childbearing. There may also be a methodological bias in that women who have attended school also are less likely to underreport births of children who died in infancy. As a consequence, although more education is linked to later marriage, neither later marriage nor more schooling substantially affects fertility levels.

Occupations of women. When young, unmarried women hold paying jobs outside the household, they often marry at an older age. Whether women who work for pay outside the household also bear fewer children has been studied extensively, but there is little empirical evidence that women who are economically active delay or forego childbearing for that reason. Furthermore, while in many developing countries responsibility for child care sometimes constrains women's economic activity, recent studies in Ghana, Kenya, and Nigeria have found no evidence that African women with more children were less likely to be working. Although single women in urban areas are more likely to work outside the household, thus perhaps facilitating later marriage, the effect of this phenomenon on the number of children they bear has been negligible.

Latin America. Investigating age at marriage in Latin America is particularly difficult because many families are established by consensual union, without legal or religious sanction. Other unions are sanctioned religiously or legally, or both. Early censuses often counted only legal marriages. Recently some countries, for example Brazil and Mexico, have counted people in religiously sanctioned marriages as married even if the unions were not legalized. Many countries have added a category to their census reports for consensual unions, *de facto* unions, or free unions, in addition to the usual categories of marital status: single, married, separated, divorced, and widowed. Changes in reporting from one census to the next make data on trends in age at marriage unreliable. Even where consensual unions are now officially counted, people sometimes fail to report them to census takers.

The birth of a child may be a better indicator of a union than marriage as officially reported. The age-specific fertility rate of women 15–19 will be used here to substitute for the percentage married at those ages, since the former appears to reflect more accurately the prevalence of early unions.

Prevalence of early unions. The average proportion of women 15–19 reported as married in thirty Latin American countries where data have been collected since 1960 was only 17 percent compared with more than 50 percent in the Indian subcontinent and Africa. Although fewer women in this age group were reported married than in any other region except East Asia, early childbearing was not uncommon. The age-specific fertility
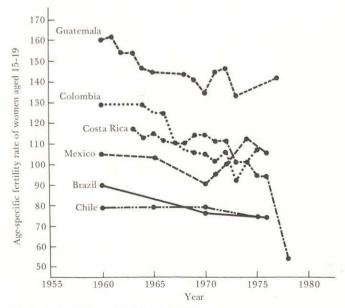
rate for women 15–19 was substantially higher than the average in East Asia, almost as high as that in the Middle East, Southeast Asia, and the Indian subcontinent, but far below that in Africa.

Low total fertility rates have been reached in a number of Latin American countries without the very low rates of early childbearing that have contributed so substantially to low total fertility rates in some Asian countries. Of the thirteen Latin American countries or areas with total fertility rates of less than 4, ten had age-specific fertility rates for women 15–19 of more than 70, and two, Costa Rica and the U.S. Virgin Islands, had rates of more than 100.

Trends in age at marriage and fertility. Two-fifths of all the countries in this region for which data were available showed declines in fertility among women 15–19, whereas the remainder showed little change. Fertility rates in this age group for selected countries are shown in Figure 3. Where fertility was falling among young women, total fertility rates also were falling. In several countries, however, as the analysis of prevalence suggests, total fertility was declining without any noticeable drop in the fertility of young women.

In Central America and the Caribbean, the fertility of women 15–19 has declined since about 1960 in nine of the sixteen countries and areas for which data are available. In these nine areas—Barbados, the Dominican Republic, Guatemala, Haiti, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, and the U.S. Virgin Islands—the total fertility rate is declining as well. In the

FIGURE 3. *Trends in early fertility, selected Latin American countries, 1960–1978*

Source of data: Henry and Piotrow, 1979

remaining seven countries—the Bahamas, Costa Rica, El Salvador, Honduras, Jamaica, Martinique, and Mexico—the fertility rates of women 15–19 have not changed markedly. The Bahamas and Honduras also showed little change in total fertility, but in Jamaica, Martinique, and El Salvador, total fertility dropped. In Costa Rica and Mexico, the total fertility rate dropped precipitously despite a virtually unchanging age-specific fertility rate among women 15–19.

In South America, fertility rates of women 15–19 have not changed markedly in most countries. Data are available for eleven of thirteen nations. Six—Argentina, Bolivia, Chile, Ecuador, Paraguay, and Uruguay—show little or no recent downward trend in early fertility. Total fertility also has not changed in these countries, with the exception of Chile and Paraguay. Chile presents a dramatic contrast: total fertility dropped 40 percent in fifteen years, from 5.1 in 1960 to 3.0 in 1975, while the age-specific fertility rate of women 15–19 remained virtually unchanged between 70 and 80, a moderately high rate. The reason, of course, is substantial drops in the fertility of older women. In every age group of Chilean women over 30, fertility fell by more than 50 percent. In five South American countries—Brazil, Colombia, Guyana, Venezuela, and Peru—declines in both early fertility and total fertility have occurred.

With few exceptions, fertility declines among very young women have not contributed substantially to the total fertility declines of Latin American countries. In most countries 10 percent or less of the declines were attributable to women 15–19. The much larger fertility declines among older women in countries such as Colombia, Cuba, Chile, and Costa Rica occurred largely because contraception became more readily available and abortion was more widely practiced, even though illegal.

Conclusions. The first and most obvious conclusion to be drawn from this overview of age at marriage and fertility is that both age at marriage and total fertility rates differ greatly from one part of the world to another, and indeed from one country to another. It is also clear that the relationship between age at marriage and fertility is different in different parts of the world (and, again, in different countries and even within countries) depending on other demographic factors, definitions of marriage, prevailing cultural patterns, socioeconomic changes, and above all on the availability and use of birth control methods.

In general, in the developing world, East Asia has by far the lowest prevalence of early marriage and the lowest fertility rates as well as the highest percentages of women economically active (at ages 20–24) or in school and the highest percentage of population in urban areas (see Table 1). Latin America ranks second in every respect

TABLE 1. *Early marriage, fertility, and socioeconomic factors: regional mean rates based on most recent available data*

	% of females aged 15–19 ever-married	Age-specific fertility rate, 15–19	Total fertility rate	% of females in school at 1st & 2d levels	% of females aged 20–24 economically active	% of population in urban areas
East Asia	2	9	2.5	92	61	65
Southeast Asia	20	101	5.2	57	38	20
Indian Subcontinent	58	101	5.5	40	17	19
Middle East	34	99	6.1	36	16	34
Africa	55	164	6.2	30	46	16
Latin America	17	89	4.9	73	39	57

SOURCE: Henry and Piotrow, 1979; reprinted by permission.

except economic activity of women, where Africa is second. With respect to other variables, Africa has the second highest prevalence of early marriage, close to that of the Indian subcontinent, the highest early and total fertility rates, and the lowest percentage of women in school and of urban population. Unfortunately, much of the African data are less current than data from Asia and Latin America.

Other interregional comparisons are more tenuous. On the whole, the Middle East has a slightly higher total fertility rate than might be expected from a relatively high age at marriage, whereas the Indian subcontinent, especially India itself, has a somewhat lower total fertility rate than might be expected from a relatively early age at marriage. The somewhat lower-than-expected fertility rate in relation to age at marriage in the Indian subcontinent and in relation to socioeconomic factors in Southeast Asia may well be due to extensive family planning programs, while the higher than expected fertility rate in the Middle East may be due to severely restricted economic opportunities for women.

All three factors generally associated with age at marriage—education of women, female economic activity, and urbanization—make about the same difference in Asia and the Middle East. In Africa, female school enrollment rates are linked to age at marriage but economic activity and urbanization are not. In Latin America, age at marriage differs little among countries regardless of differences in these factors. When early fertility rates are used as an index of early unions, urbanization and economic activity both make a difference. For the four regions together, education accounts for the greatest differences in age at marriage, followed by urbanization, while economic activity makes very little difference.

Pinpointing socioeconomic influences on age at marriage is complicated by the fact that age at marriage and first birth, in turn, influence social and cultural events. Leaving school, marrying, being involved in the money economy, and having a child are all interrelated. The causal and temporal order of these events varies from one woman to the next. Some women leave school or jobs to marry, some leave because they are pregnant, some postpone childbearing to attend school or to work, some consider themselves married only after they have a child, some marry in order to have a child, and so on. While it is relatively easy to identify associations among age at marriage, fertility, and socioeconomic factors, it can be difficult, often impossible, to determine what is cause and what is effect.

As young men and women try to adjust to the great social and economic changes now under way in every country, both marriage patterns and contraceptive usage patterns will be affected, often in close interaction with one another.

On the one hand, social and behavioral change is likely to diminish the effect of age at marriage on population growth, while, on the other hand, the demographic momentum of previous growth will amplify the impact of changes in age at marriage. For at least three reasons a rising age at marriage is having less impact on fertility now than it did in Europe and Asia in the past.

In nearly all countries where fertility is falling sharply, these declines are taking place primarily among women over age 25—most of whom are married and therefore presumably practising birth control.

In a growing number of countries, marriage does not always signify the initiation of female sexual activity. Thus an increase in age at marriage in these areas will not automatically mean a comparable postponement of sexual activity and first births. The higher the age at marriage, the less likely it is to mark the beginning of sexual activity.

Finally, as age at marriage increases, countries will almost certainly experience at the same time an increase in the availability and use of contraceptives, which, whether used by older or younger women or within or outside marriage, will make increasingly important contributions to any fertility decline. In nearly all countries where increase in age at marriage has been an important factor in declining fertility, much of this increase oc-

curred before effective methods of birth control were widely available.

By contrast, there is a very important reason that, for the last two decades of the twentieth century at least, age at marriage may remain an influential factor in the demographic equation. During the 1980s and the 1990s there will be more young adults in their peak reproductive and marriageable years (age 15–29) than ever before in history. More than 40 percent of the population in the developing countries today are under 15 years old. By 1990, there will be 40 percent more potential parents aged 15–29 than there were in 1975, and more than twice as many as in 1960—in other words, a total of more than one billion potential husbands and wives, fathers and mothers. If this new generation marries young and then begins to reproduce at an early age, it will be difficult for many countries to reduce population growth to the desired levels even if marital fertility is sharply reduced.

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See also Adolescent fertility; Fertility decline; Marriage and divorce; Nuptiality indexes.

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AGING POPULATION

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1.
OVERVIEW

The aging of a population is a concept of the transition from a population with high fertility and low life expectancy, depicted by a typically broad-based age-sex pyramid with sloping sides, to a population with low fertility and low mortality, depicted by a narrow-based and steep-sided pyramid. [*See* Composition *for illustrations of these typical pyramids.*] The economic and to some extent the social implications of an aging population are discussed in the following article with particular reference to the United States. Many of the concepts and analyses presented in the article apply as well to other industrialized, especially Western, countries and to a certain extent to Eastern European countries. It is common to consider the elderly (after some arbitrary statistical age such as 65) as part of the dependency burden on those of working age (often 15–64). [*See also articles on* Canada, Japan, Europe, *and* Soviet Union *for discussion of other aging populations.*]

A related but distinct area of research centers around the social and economic needs of aged people and of their social, political, and economic impact on society. Increased attention is being paid to this as the absolute as well as the relative age of the portion of the population that is over 65 increases in an unprecedented manner.

Table 1 shows the expected changes in numbers and rates of increase of the aged population from 1980 to 2000. As may be seen in the table, in this twenty-year period alone, the world population will increase by 40 percent, whereas the aged population will increase by 56 percent. During this period, in more developed countries, 43 percent of the population increase will occur in the aged group, as contrasted with 9 percent of the population increase in less developed countries. Nonetheless, in the less developed countries alone, some 148 million people aged 65 and over will be added to the population of 1980. Their needs for social services and economic assistance will vary according to the effect of the process of aging on the individual, as well as according to the local customs and circumstances. Considerable thought is now being given, especially in developed countries, to the differing needs of the "young old"—people perhaps from age 65 to 75 or 80— and of those over that age. Specific

TABLE 1. *Expected population changes, world total and aged population (millions), 1980–2000*

	World	More developed countries[1]	Less developed countries[2]
Total population, all age groups			
1980	4,415	1,131	3,284
2000	6,199	1,372	4,927
Increase	1,784	141	1,643
% Increase	40%	12%	50%
Aged population, 65 and over			
1980	372	171	201
2000	580	231	349
Increase	208	60	148
% Increase	56%	35%	74%
Aged as percent of total population increase	12%	43%	9%

[1]Includes northern America, Japan, all regions of Europe, Australia, New Zealand, and the Soviet Union.
[2]Includes all other countries of the world.
Source of data. Calculated from United Nations, 1980.

needs of both groups include social security, specialized medical care, specialized housing, specialized recreational facilities, and so forth.

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2.
UNITED STATES

The term "aging population" refers to an increase in the proportion of a population in older age groups, that is, over age 55 or over age 65, usually reflected in an increase in a population's median age. This article is limited to the United States, but the social and economic consequences of an aging population are similar in other industrialized nations. Emphasis is placed on the economic status of the elderly, including the role of Social Security benefits, factors influencing the labor supply of the elderly, availability of pensions, and the macroeconomic response to changes in the age structure.

Causes and Effects. The process of population aging is important because of its impact on the economic and other aspects of a society via individual behavior. It in-

volves, among other things, the dependency ratio (the number of economic dependents per 100 productive members of society), the capacity of the elderly for work, their productivity, income distribution, consumption patterns, and attitudes affecting investment.

Determinants of age structure changes. While a population's age composition may be influenced by mortality rates and temporarily modified by changes in net immigration, the age structure of industrialized countries today is governed primarily by fertility behavior. The reduction in mortality still achievable in modern countries may be limited and prospective legal international migration is small. In developed countries, fertility apparently is settling into the replacement or subreplacement range, which will "age" their populations in comparison with populations typical of earlier periods.

Dependency ratios and income transfers. Populations are conventionally studied in three groups: (1) those of working age, 18–64; (2) young dependents, under 18; and (3) old dependents, 65 and over. Such groupings should not be taken as an attempt to define the labor force literally; they represent proxies for the usual or typical work life. With this caveat, the ratio of those in the working age to the entire population will fluctuate around 0.6 during the next seventy–five years if fertility remains at 2.1 births per woman. A slight rise in this ratio prior to the year 2000 and a subsequent decline below the 1976 level are illustrated in Table 1 as Series II. The projections in this series include a net annual immigration of 400,000 and generate an age structure in which there are approximately 1.5 persons of conventional working age for every dependent. The total ratio of dependents to those of working age will be only slightly lower in 2050 than in 1976 and would be higher for the remainder of

this century under the Series II assumptions. The composition of the dependent population will, however, be dramatically altered as the proportion of the population 65 and older rises from 10.7 percent to 17.6 percent in 2050 with most of the increase coming after 2010.

An ultimately stationary population is shown in Table 1, Series IIX, which assumes fertility to be steady at 2.1 (essentially a matter of replacement) and no immigration. When the stationary state is finally reached where there is no further change in the size of the population, 58 percent of the population will eventually be between 18 and 64 years of age. The dependency ratio appears similarly constituted in Table 1, Series III, with its fertility rate of 1.7 and annual immigration of 400,000, since the percentage of the population in the prime working ages would rise to 64 and then fall to slightly below its 1976 level of 59. The primary difference is that a larger fraction of those aged 18–64 will consist of persons over 50 and a relatively larger number of those of dependent age will exceed 64. In the long run, after a stable-population age structure is attained, the major difference in the age structure between the replacement and subreplacement fertility projections is the increased proportion of the dependent population over age 64; that is, over 54 percent with a 1.7 fertility rate compared with 45 percent in the stationary population.

Projections of total dependency costs depend on the age distribution, together with the relative cost of providing benefits to the young and to the old. Robert L. Clark and Joseph J. Spengler (1978) report that a broader survey of the costs of public support reveals that government expenditures are three times as great for older dependents as for youths. Moreover, the average cost of supporting dependents may be higher in a stationary population than in a growing one, because in a stationary population, a larger fraction of those of dependent age will be over 64. Private costs of maintaining young dependents may be sufficient to offset this higher public cost of supporting the elderly. For example, Hilde Wander (1978) finds that in West Germany the total cost of rearing a child to age 20 is one-fourth to one-third more than that necessary to support the average 60-year-old person over the rest of his or her lifetime. Much of the expenditure on children is in the form of investment in human capital. Thus, a reallocation of resources toward older dependents may lower the future rate of economic growth. Difficulties are involved in the shift to funding of benefits for older dependents at the federal level from expenditures on youths largely at the state and local levels and by family units.

How burdensome dependents will be in a stationary population will depend mainly upon how large a frac-

TABLE 1. *Population projections for the United States (millions), 1976–2050*

Age	1976	1985	2000	2025	2050
Series II					
Total	215.1	232.9	260.4	295.7	315.6
0–17	65.2	62.3	69.0	72.5	76.5
18–64	127.0	143.3	159.6	172.3	183.6
65 and over	22.9	27.3	31.8	50.9	55.5
18–64/total	.590	.615	.613	.583	.582
65 and over/total	.107	.117	.122	.172	.176
Median age	29.0	31.5	35.5	37.6	37.8
Series IIX					
Total	215.1	228.9	248.4	267.4	269.4
0–17 65.2	60.8	64.9	64.9	64.3	64.2
18–64	127.0	140.8	152.1	154.5	155.5
65 and over	22.9	27.2	31.5	48.6	49.8
18–64/total	.590	.615	.612	.578	.577
65 and over/total	.107	.119	.127	.182	.185
Median age	29.0	31.7	36.0	38.4	38.6
Series III					
Total	215.1	228.9	245.9	251.9	231.0
0–17	65.2	58.3	56.9	49.4	43.8
18–64	127.0	143.3	157.2	151.6	134.9
65 and over	22.9	27.3	31.8	50.9	52.3
18–64/total	.590	.626	.639	.602	.584
65 and over/total	.107	.119	.120	.202	.226
Median age	29.0	32.0	37.3	42.4	43.7

Source of data: U.S. Bureau of the Census, 1977c, tables 8–12, D-2. Series II assumes fertility at 2.1 and immigration at 400,000 per year; Series IIX assumes fertility at 2.1 and no immigration; Series III assumes fertility at 1.7 and annual immigration of 400,000.

tion of those aged 55–64 (11.3 percent of a stationary population) remains in the labor force. If one-half of those aged 55–64 should transfer their economic status from membership in the labor force to membership in the old-dependent category, the labor force would be reduced about 10 percent and the ratio of active persons to dependents of all ages would be reduced from about 1.5 to about 1.14 (Spengler, 1978).

An increased proportion of the national income is required to support older dependents if the retirement age is lowered. Alternatively, rises in the age of dependency significantly alleviate future increases in cost.

Economic Status of the Elderly. The economic well-being of the nation's elderly has been the focus of considerable public debate during the past two decades. The following discussion outlines the absolute and relative economic position of older Americans through an examination of currently available data.

Income of the aged. The number of individuals 65 and over with incomes below the Social Security Administration's poverty level declined from 5.5 million in 1959 to 3.3 million in 1976, thus reducing the proportion of the nation's elderly below this poverty index from 35.2 to 15.0 percent. The decline in the poverty rate of the aged families was even more pronounced, falling from 27 to 8 percent during this period, (U.S. Bureau of the Census, 1977a, p. 21, and 1977b). The 1976 figures, however, compared to 1974 data, represent increases in both the number and incidence of older persons who are poor. The decline in the incidence of poverty among the aged has been accelerated by the expansion in coverage and the liberalization of benefits in both public and private pension systems as well as by the initiation of additional income transfer programs such as Supplementary Security Income (SSI). Even this relatively significant reduction understates the actual drop in incidence of poverty among older persons because of the simultaneous expansion of in-kind benefit programs over the last two decades. Hearings before the House Committee on Aging revealed forty-seven major federal programs intended for the benefit of the elderly in the areas of employment, health care, housing, income maintenance, social service programs, training and research, and transportation. Marilyn Moon (1976) estimated that in-kind transfers to the aged total more than 10 percent of the size of their current money incomes. Rising real wages during work life have also contributed to the increasing income of successive aged cohorts.

Since 1965 the median income of families in which the head of the household is 65 years old or older has more than doubled; the increase from $3,514 to $8,721 in the 1976 represents a rise in real income of approximately 38 percent. The relative income position of the aged also has shown gradual improvement over the last decade. For example, the ratio of median income of families whose head is 65 years old or over to the median income of all families has risen from 49.3 percent in 1965 to 58.3 percent in 1976. However, this measure of the relative economic status lies only slightly above its 1950 level of 57.3 percent. Theodore S. Torda (1972) traced a decline in the relative income of the elderly during the early 1960s and its subsequent rise. Torda found that between 1965 and 1971 "all categories of the elderly (families, unrelated individuals, males and females) enjoyed growth rates in real income above the national average" (Torda, 1972, p. 10).

Income differences among different age groups within the elderly population need to be recognized. In 1976, a family whose head was aged 55–64 had a median income of $16,118, while the median level for families whose head was 65 and over was only $8,721 or an income ratio for these groups of 54 percent (U.S. Bureau of the Census, 1977c). Data analyzed from the 1972 Survey of the Status of the Elderly showed that the median income of all units aged 60–61 was $6,993 in 1971. The comparative figure for those 62–64 was $6,388, while units 65–67 had a median income of only $4,450. Further aging was associated with a continued decline in income to $3,503 for those 68–72 and $2,480 for those 73 and over (Grad, 1977).

Income sources. Social Security is the most prevalent source of income for the aged. In 1974, more than 90 percent of all families whose head was 65 years old or older were receiving Social Security benefits. Approximately 70 percent of the aged were receiving income either from private pensions, annuities, or other forms of privately attained "unearned" income. The 1970 Survey of Newly Entitled Beneficiaries (SNEB) conducted by the Social Security Administration (SSA) found that 32 percent of their sample of married men and their wives were receiving private pension benefits, while an additional 12 percent had benefits from other public retirement plans (Fox, 1973). The SNEB showed that 55 percent of the married couples and a somewhat smaller percentage of individuals were able to supplement their living standard with income from accumulated assets. The elderly may also be expected to generate a flow of expendable funds by drawing down their stock of wealth. In addition to these sources of income, approximately half of all aged families continue to depend on earnings to maintain consumption patterns during the "retirement" years.

The composition of the income of the elderly varies significantly with the level of income. The share of income represented by Social Security benefits declines sharply with the rising income of beneficiaries. This decline occurs because of the progressivity of the benefit

structure, a maximum benefit, and the fact that individuals with Social Security benefits at or near the maximum are more likely to have additional sources of income. The proportion of income derived from other public pensions, private pensions, earnings, and assets rises steeply with increases in the level of total income (Fox, 1973; Grad, 1977).

Labor Supply of the Elderly. The dependent variable in estimates of labor supply is intended to capture the market response of individuals to changes in other factors. One of the difficulties in reviewing studies of the participation of the elderly in the labor force is the variation in the use of a measure of labor supply or retirement. A particular problem arises when the expected influence of factors is in opposite directions for the alternative indicators of participation. The following have been employed in different studies as the variable measuring individual labor supply response: termination of a particular career, extent of earnings, hours of work, receipt of pension benefits, individual's perception of retirement status, rates of participation in the labor force, annual work rates, and expectations of retiring. Using aggregate data, labor force participation rates and receipt of pension benefits are the primary measures of labor market activity.

Clearly, it is possible for a person to be counted as retired by some of these measures, but not by others. For example, military personnel can retire from the service (termination of a career) and begin receiving pension benefits, yet still work forty hours a week for another employer. Thus, the reader must be cautious when comparing studies of older people in the labor force.

The elderly are not a homogeneous group, as measured by a variety of socioeconomic factors including age. Therefore, the influence of social or economic conditions on those, say, 55–64 years old may be different from that on those over 65. Causes of early retirement prior to age 65 may be different from causes of withdrawal from the labor force at or after age 65. In addition, the significance of explanatory variables may depend on whether a person is examining individual decisions about working or long-term trends in economy aggregates. In fact, some of the aggregates may move in the opposite direction. It is possible for average retirement age—as measured by permanent withdrawal from the labor force—to rise while rates of participation in the labor force are falling.

Individual and economic factors. The primary factors that influence the decision of the elderly to remain in the labor supply include the following: pensions, health, the character of the economy, financial and other characteristics of the individual and his or her family, and the job situation.

An increasing number of studies find that together pension systems—benefits and labor force restrictions—and health are the most important of these influences. The health of an individual may also affect the availability of pension benefits.

Most examinations of the decisions of individuals in older cohorts to work or retire have found that eligibility for Social Security benefits has lowered the rates of active participation in the market, especially over the last two and one-half decades. Prior to this time, benefits may have been so small as to have had only a negligible effect on participation. Examining trends in participation from 1890 to 1950, Clarence Long showed a significant and continuing pattern of reduced market work during this period when public and private pensions were virtually nonexistent. He concluded that prior to 1950 "Social Security and pensions were not the main force in bringing about the withdrawal of elderly persons from the labor market" (Long, 1958, p. 163). The expansion in coverage and level of benefits since 1950 apparently has resulted in Social Security benefits playing a major role in determining the proportion of older individuals in the labor force. Joseph Pechman, Henry Aaron, and Michael Taussig (1968), analyzing 1960 aggregate data from nineteen countries in a multivariate regression, reported that increases in the ratio of average Social Security benefits as a percentage of average manufacturing earnings produced lower rates of participation in the labor force for older cohorts.

Periodically, the Social Security Administration has conducted surveys of older cohorts. These surveys have indicated an increasing tendency of retirees to respond that desire for leisure or retirement and the availability of pension income are the primary determinants of their withdrawal from the labor force.

Pension benefits that are subject to an earnings test require that as earnings rise the benefit is reduced. A survey of more than one hundred countries indicated that over 80 percent of the Social Security systems provided for retirement tests (Kirkpatrick, 1974, p. 3). Such tests may apply only to income above a certain percentage of past earnings or, as in the United States, a fixed ceiling for all pensioners. Above this ceiling, the benefit is reduced with additional earnings. For the United States, the 1977 ceiling was $250 a month, or $3,000 per year, with benefits being reduced $1 for every $2 in earnings above the ceiling.

The theoretical implications of this tax, which should include an income and substitution effect on hours of work with the sign of the final adjustment ambiguous, have been outlined by Wayne Vroman (1971). Most studies conclude that this tax on earnings reduces the labor supply. According to Vroman, it is possible that leisure may not be a normal good for those who are in-

voluntarily retired—still in the labor force but consuming more leisure than desired. The 1965 amendments that raised the earnings ceiling appear to have caused a small increase in the proportion of beneficiaries who have covered earnings. Kenneth G. Sander (1968), however, reported that workers did not distinguish for decisions to work between the 100 percent tax on earnings that existed prior to 1960 and the subsequent 50 percent tax rate.

It has been argued that rates of participation in the labor force should be unaffected by an earnings test because of the untaxed portion of earnings. Thus, workers might reduce hours but would never totally withdraw from the labor force. One method of reducing working time is to reduce the number of weeks worked per year. If this occurs, in any given survey week the rate of participation would be owing to the earnings test, with annual work rates being unaffected.

Response to the earnings test in the form of reduced hours may be responsible for the increasing tendency of males over 65 to engage in part-time work. The proportion of employed males who are voluntarily part-time has risen from 20 percent in 1957 to 42 percent in 1972 (Campbell and Campbell, 1976). The availability of private and public pension benefits in addition to Social Security tends to reduce activity in the labor market still further. According to one life-cycle model, promise of pension benefits may induce earlier retirement (Feldstein, 1974; Munnell, 1977). Another model illustrates that the response to an increase in the replacement rate (retirement benefits divided by pre-retirement earnings) from a pension may not be so certain. The individual delays retirement until the present value of net-wage income plus accrued pension benefits from postponing retirement are equal to the present value of pension benefits being lost by the continuation of work. In this framework, increases in the replacement rate are ambiguous; however, with declining wages, higher pension benefits will always lower the retirement age. Increases in benefits that are not wage-related will induce earlier withdrawal from the labor force (Hemming, 1977).

One analysis of the Retirement History Survey (RHS) data indicates that the influence of private pension benefits is less than that of Social Security (Quinn, 1975). The influence of pension eligibility was found to fall mostly on those with health limitations.

A review of the influence of private pensions on the labor supply would be deficient unless the resulting imposition of compulsory retirement age were recognized. A 1961 survey of firms employing 50 or more workers showed that those plants without pension plans rarely had compulsory retirement provisions, while only 25 percent of the employers with pension systems did not have mandatory retirement clauses (Slavick, 1966). Four out of five newly entitled beneficiaries in the SNEB of late 1969 with compulsory retirement policies on their most recent job indicated that they were covered by a pension plan (Reno, 1976). The Bureau of Labor Statistics reported that in 1974 over 40 percent of the covered workers were in plans with mandatory retirement provisions. Thus, it seems that the existence of compulsory retirement is closely related to participation in a pension plan. The following justifications have been given for compulsory retirement: to increase productivity of business, to serve as an impersonal screening device for removal of older workers, to avoid the increasing health problems of older workers, and to reduce the inflexibility of work assignments resulting from work rules, seniority, and pay scales (Schulz, 1974).

Retirement from a job or termination of a long-term career does not necessitate a person's withdrawal from the labor force. However, retiring from a current job generally entails loss of seniority and with it, the elimination of protection from layoff. It may be more difficult for the older worker to find new employment, and the pension guidelines may prevent work related to previous employment—especially pensions contributed to by more than one employer. The termination of seniority and loss of job-specific skills may imply a fall in the wage offers that older workers subsequently receive.

Health impairments may reduce a worker's productivity and, therefore, the market wage rates he or she is offered. In addition, such impairments could be expected to increase the individual's desire for leisure time. The likely result is that fewer individuals with health limitations would be in the labor force than workers without ailments.

A significant empirical problem is the lack of adequate objective data on the health of individuals. The use of survey responses may be biased as the respondent attempts to provide a socially acceptable reason for retirement. Colin D. Campbell and Rosemary G. Campbell (1976) believe that many SSA studies may have underestimated the influence of Social Security on retirement because of the interview technique.

A 1952 Current Population Survey of households with one or more persons aged 65 or over supports the assessment that health is a significant determinant of participation by the elderly in the labor force (Steiner and Dorfman, 1957). A series of surveys by SSA indicates that poor health is the primary reason given by individuals for their retirement (Wentworth, 1968). The 1968 SNEB found that 44 percent of male workers gave health as their main reason for leaving their last job; this influence, however, declines with age. For men aged 62, 57 percent gave health as the dominant reason for their withdrawal

from the labor force, whereas 48 percent of those 63–64 years of age, and only 23 percent of those aged 65 named health (Bixby, 1976).

The RHS data indicate that for men and women, health is a primary cause of early retirement.

This overview indicates that pension income and health limitations usually exert the dominant influences over the participation of older workers in the labor supply. Recent debate has centered on which factor is the more significant in inducing retirement. A strong interactive effect may exist between these two variables. Joseph F. Quinn (1975) found the Social Security effect to be five times greater for those with some form of health impairment. Early retirees may fall into two groups. The first group is characterized by good health, sufficient financial resources, and a desire for additional leisure time. The other group consists of those with health problems.

The composition of retirees from a particular cohort may change as they age. Disadvantaged retirees with health problems appear to form a larger proportion of total retirees while the cohort is in its late fifties than for people in their sixties.

Pensions. The expansion of the pension network over the past twenty-five years has significant implications for the behavior of individuals and the performance of the economy. This section focuses on the growth and development of public and private pensions and the economic responses to these institutions.

Social Security. The Social Security Act was passed in 1935 to provide cash benefits to individuals whose income from earnings had been reduced by retirement. A compulsory Social Security system has evolved, which provides benefits related to earnings. Some analysts argue for a system of forced savings to be used as a method of requiring individuals to finance partially the income transfer program that will provide benefits to them in their old age; otherwise prudent workers, who saved for their own retirement may also be forced to provide benefits to those who did not save.

Edgar K. Browning (1975) has shown that political forces in a democracy will produce a social insurance budget that is too large as judged by the criteria of economic efficiency. In an earlier paper he argued that the nature of intergeneration transfer indicates that the windfall gains of the initial generation are paid for in the form of a national debt that is passed forward to later cohorts (Browning, 1973).

Benefit payments are derived by calculating the average monthly wage subject to the payroll tax over a specified number of years and then applying a progressive computational formula to determine each individual's primary insurance amount. The actual benefits that a worker receives are governed by age at retirement, marital status, and spouse's age.

The 1972 amendments to the Social Security Act provided for automatic adjustments in the benefit formula in response to changes in the cost of living. While the adjustment mechanism worked well in maintaining the real benefits of retirees, high rates of inflation led to rising future replacement rates for those still working. This overindexing of benefits was a function of the manner in which the benefits are determined. Legislation enacted in 1977 indexed benefits and earnings in a manner that will stabilize future replacement rates.

Social Security benefits have been financed through a payroll tax levied in equal portions on the employer and the employee. The financing of the system is essentially a pay-as-you-go scheme with a small trust fund being created to smooth out annual payments. Questions concerning the solvency of the Social Security program have three sources. First, short-run cyclical problems arose because of the prolonged recession in the 1970s, which reduced tax revenues and increased the number of beneficiaries. Second, a significant long-run problem was created by the increase of replacement rates due to overindexing. Finally, the demographic pressures of the changing age structure of the population will increase the ratio of beneficiaries to workers, necessitating a restructuring of the tax and benefit schedule.

Retired workers who have participated in the Social Security system are generally acknowledged to have received benefits that far exceed the accumulated value of their tax payments. Pechman, Aaron, and Taussig (1968) estimated that workers who were first covered in 1937 and retired in 1967 may have a present value of benefits of between two and ten times the accumulated value of their tax payments and accrued interest. Future generations will obviously not fare so well, but will they receive even a reasonable "return" on their contributions? The concept of attempting to estimate a rate of return to a tax may seem strange; however, since the system has been promoted as an earnings-related form of deferred compensation or forced savings, such research is of interest. The use of general government funds to finance future Social Security benefits may further cloud this avenue of investigation.

Benefit-tax values are highly sensitive to assumptions about the growth rate of earnings, the interest rate, future changes in the benefit or tax schedules, and the incidence of the employer portion of the tax. The return for any specific workers will also depend on marital status, sex, income level, and age at which taxes were first paid. The aging of the population will result in increased taxes and will lower future returns. Henry J. Aaron (1977) argued that the interaction among educational attainment, differential mortality rates, and age of entry into the labor force produces a regressive tax-benefit structure. Considerable attention has recently been focused on

the relationship between pensions and individual savings. A model of economic decision making illustrates how individuals incorporate the promise of future benefits into their thinking. Because they expect Social Security wealth they reduce their individual savings. At the same time, these benefits may induce workers to retire at an earlier age, thus increasing savings per year in the labor force. Therefore, the net effect of Social Security is theoretically indeterminant. Numerous econometric studies have not yielded a final answer to the relationship between Social Security and savings.

Private pensions. During the past four decades, private pensions have expanded rapidly throughout the American economy. The number of workers covered by these plans has risen from slightly more than 4 million in 1940 to almost 30 million in 1974; annual employer contributions have increased from $180 million in 1940 to $1.75 billion in 1950 to $23 billion in 1974; and the book value of the assets of retirement plans had grown to $192 billion by the end of 1974 (Skolnik, 1976). This rapid growth in private pensions has been attributed primarily to preferential tax treatment accorded to this form of compensation and the earnings from its assets.

Studies by the government have shown that the incidence of coverage varies greatly among industries, ranging from 80 percent of workers in communications and public utilities to less than 35 percent of workers in construction and retail trade (United States, Social Security Administration, 1973). Length of job tenure was positively correlated with pension coverage as was the level of compensation. Male workers were more likely to be in pension plans than female workers. Union status and size of the firm were important determinants of pension coverage.

A unique perspective of the impact of pension funds on the equity market is provided by Peter Drucker (1976). Drucker argues that at least 25 percent of the equity capital in the United States is owned by workers through their pension funds with at least another 10 percent being held by the pension funds of the self-employed, public employees, and school and college teachers. He believes that within the next ten years, pension funds will increase their holdings of the total business equity from the present 33.3 to at least 50 or 60 percent. Thus, Drucker labels the American economy one of pension fund socialism.

Macroeconomic Response to Population Aging. The economic response of a society to the aging of its population is dominated by the impact of aging upon individuals, together with increase in the relative number of older persons. The behavioral response of an individual to aging takes two interrelated forms: (1) reaction to the physical and psychological effects of aging and (2) change in economic behavior as the working years before retirement diminish in number and reduce prospective economic opportunities. The response of an individual to the aging process is influenced by changes in social status that can affect economic behavior as well as by "social expectations about age and aging" that "affect the capacities and perception of capacities of older people" (Haber, 1972, pp. 14, 162, 165–167).

The economic reaction of a nation to the aging of its population is twofold, consisting of the response of the autonomous individual to his aging and of the reaction of a population to the collective or synergistic impact of an increase in the portion of its members describable as old. This reaction may vary somewhat from cohort to cohort when the life histories of cohorts or sets of neighboring cohorts differ significantly.

Effects of the aging of a population viewed as a phenomenon of group behavior need to be distinguished not only from the response of autonomous aging individuals but also from the effects of the slowing down of population growth. For, as explained earlier, population aging, as distinguished from individual aging, is essentially a product of decline in the rate of population growth, a decline that will modify some characteristics of an economy.

Although population aging is essentially a twentieth-century phenomenon and subject of inquiry, the economic significance of individual aging did not entirely escape notice in the nineteenth century. As early as 1834, John Rae noted a relationship between length of life and the propensity to save, a connection later emphasized by Gustav Cassel, who associated the tendency not to save with shortness of life and lowness of the interest rate, although he neglected the "estate motive," the propensity to accumulate for heirs. While Eugen von Bohm-Bawerk's emphasis upon futurity had indicated the significance of length of life for amassing capital, it remained for Irving Fisher to relate saving and dissaving to the life cycle of the individual. With the explicit identification of the role of uncertainty in economic affairs, it became possible to assess the impact of change in life expectancy and the distribution of lifetime uncertainty upon decisions concerning consumption.

Underlying the economic concomitants of aging, both at the aggregate population level and at the autonomous individual level, are mainly the physical and psychological effects of the aging process upon individuals, together with the diminution of an individual's anticipated life expectancy and future prospects as he or she grows older. The macroeconomic significance of an aging population turns, of course, on the size and changes in the size of the portion of the population describable as old (e.g., over 60, or 65, or 70), together with the degree to which aging is likely to affect a population's productive power, investment behavior, consumption patterns, and political, along with politically affected, behavior.

Productivity. Of considerable economic importance are the effects exercised by aging upon the productivity of individuals and hence upon their earnings and economic behavior (e.g., consumption, savings, and participation in the labor force) affected by income. The correlation between productivity and age varies not only with individuals but also with the nature of their employment. Moreover, it may be subject to modification as when the nature and requirements of particular employments are better adapted to the capacity and skills of the individual worker. Presumably, with an increase in the relative number of persons in and beyond their late fifties, greater attention will be given to means suited to preserve the skills and productive capacity of such workers. To the extent that productivity varies over the life cycle, future changes in the age structure of the population will have an impact on the nation's economic efficiency and rate of productivity growth.

Mobility. Both horizontal and vertical socioeconomic mobility are affected by aging. Horizontal mobility is, *ceteris paribus,* somewhat inversely related to age, in part on physical grounds and in part because the opportunity to recoup the costs of movement and benefit through movement is inversely related to age. Under modern conditions, however, the tendency to migrate is greatly influenced by such conditions as education and status in the labor force. Older persons are seen to respond differently than younger persons to factors that influence migration decisions. Return migration to state of birth is more characteristic of elder migrants, while other considerations are more important to young workers. [*For related discussion, see* INTERNAL MIGRATION, *article on* UNITED STATES.]

The constraint upon vertical mobility imposed by aging may prove important in a comparatively stationary population in which a relatively large and stable fraction of the population of conventional working age is over 50. Even so, the flexibility of an economy need not be greatly reduced with approximately 2 percent of the labor force being replaced each year. Moreover, given sufficient education and suitable facilitation of horizontal and vertical movement of members of the labor force, something like an optimum occupational composition of the labor force may be sustained.

More important than the constraints of age as such upon vertical mobility is the limitation attributable to almost zero population growth and the ensuing replacement of the cylindrical structure. Nathan Keyfitz has constructed a model designed to show how the opportunity of a representative individual to move upward through a hierarchical social structure is associated with life expectancy, the rate of population growth, and the corresponding age structure. He finds that the members of a growing population or organization will be pro-

moted more rapidly on an average than members of a stationary population or organization. This slowing down of the progress of the representative individual from lower to higher positions is the result mainly of slowness of population growth, not of increase in life expectancy. While "the mortality of one's contemporaries is favourable to one's own promotion," this "mortality effect is small in comparison with the population growth effect" (Keyfitz, 1973, p. 339).

The occupational structure may prove less flexible. Slowing down in status promotion may be partly compensated by reduction in reward differentials between status levels, for in a slowly growing or stationary population, the number of younger members of the labor force will be smaller relative to low-status posts, while the relative number of older persons will be greater relative to high-status posts, with the result that the earnings profile will tend to be less steep.

Consumption. Consumption may vary with age in response to a variety of physiological, economic, and social reasons. Of primary importance, however, despite the occasional stress upon the "over-65" market is the comparatively low level of the income of older persons, and the limited variability in their potential purchases and expenditure patterns.

The increase in the absolute and relative number of aged persons may not only increase the demand for products they favor, especially in areas such as Florida with a large number of older persons in their populations, but will also encourage private and public enterprise to cater more effectively than at present to the needs of older persons. The impact of the increase in the population 65 and over should be most pronounced between 2010 and 2030 when, as a result of the postwar baby boom, the number of those aged over 64 will increase to about 20 million, or by 57 percent. According to Richard W. Parks and Anton P. Barten, "an increase in the relative proportion of the old to those of working age tends to increase threshold levels of some goods such as food, clothing, and services, but it has the reverse effect on housing and durables" (1973, p. 847).

Saving. While the aging of individuals is unfavorable to individual saving, the aging of a population, in the sense of an increase in the portion of the population of working age, may be favorable to saving. The relationship between aging and saving on the part of an individual is conditioned mainly by the course of his or her annual income curve and the pattern of his or her family expenditure. As noted earlier, institutionalized saving (e.g., Social Security, pension arrangements) may discourage private saving by individuals and encourage early retirement. Early retirement, of course, increases saving per year of work.

When a population is stable and stationary, its potential capacity to form capital per worker is roughly at its long-run maximum. The tendency for greater per capita capital formation is the result of the cessation of population growth, which eliminates the need for added capital to equip net additions to the labor force. Hence, savings will be available to increase capital per head in a stationary population. Whether advantage will be taken of the capacity of a stationary population to raise the aggregate capital-labor ratio at a relatively high rate depends on the degree to which motives to work, save, and invest savings remain as strong in a stationary as in a growing population. For, within limits, population growth itself can be favorable to saving. Carrying the aging of a population to the point where it is stationary and stable entails a risk. Fertility can be reduced to a level below that needed to replace deaths, with the result that the income transfers necessary to support the aged become burdensome and unfavorable to the formation of capital.

Conclusions. The population of the United States is expected to age significantly throughout the next twenty-five to fifty years. The economic consequences of the impending age-structure changes should command a high priority in both theoretical and policy-oriented research by economists. The economic influences of population aging result from individual differences in behavior over the life cycle combined with the increase in the relative number of older persons.

Rigorous examination of life-cycle activity is a relatively recent development in economic analysis. Considerable work remains to be done to enable researchers to explore the labor supply and expenditure decisions as individuals age. The continued rise of married women in the labor force necessitates that the theoretical framework include dual-career families. The inclusion of flexible retirement ages and better measurement of health are required to permit the analysis of policy changes that alter Social Security and private pensions.

There is a dearth of empirical results concerning the consequences of age-structure changes on the productivity of the economy. This macrodemographic influence can be assessed only when additional knowledge is acquired on individual productivity over the life cycle. In addition, the aging of a population produces shifts in the dependency ratios and the composition of the dependent populations. These shifts have significant implications for programs of government support, tax policy, and age-specific consumption patterns, which have not been fully explored.

In sum, we argue that the economics of aging is an important and relatively unexplored area. Many significant policy issues that require the nation's immediate attention are related to or caused by population aging. The continued aging of the population, which is projected, will only intensify the importance of the subject.

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AMERICA

See CARIBBEAN REGION; LATIN AMERICA; NORTH AMERICA.

ASIA

The following article does not discuss Turkey, Israel, the Gaza strip, or the twelve Arab states of Southwest Asia. Because Israel presents special problems of population study and because other countries of the area known as the Middle East share, to some extent, a common culture and history, they are discussed in separate articles. See NORTH AFRICA AND SOUTHWEST ASIA.

Asia is by far the largest of the continents in both population and area. Its 44 million square kilometers (17 million square miles) comprise not quite 30 percent of the earth's land area but contain nearly 60 percent of its people. In the west the continent is separated from Europe by the Ural and Caucasus mountains in the Soviet Union and by the Caspian, Black, Aegean, and Mediterranean seas. In the southwest it is separated from Africa by the Red Sea. Bounded by the Pacific Ocean in the east, it extends from the Arctic Ocean in the north to the Indian Ocean in the south. Topography, climate, and settlement patterns vary tremendously: from the earth's highest mountain to its lowest valley, from arid desert wastelands to lush rain forests and monsoon zones, from northern Arctic tundra to temperate areas to the southern tropics, and

from teeming cities and densely populated agricultural lowlands to sparsely populated highlands.

Asian cultures, language and ethnic groups, developmental levels, and demographic parameters are equally varied. The 1978 per capita gross national product (GNP) ranged from around $3,000 in the Soviet Union, Hong Kong, and Singapore to about $100 in Bangladesh, Nepal, Laos, and Bhutan, with the notable exception of $7,000 in Japan. Life expectancy ranges from around 40 years in Afghanistan, Nepal, Laos, and Bhutan to more than 70 years in the Soviet Union, Japan, Hong Kong, and Singapore; for the continent as a whole it is approaching 60 years as compared to more than 70 for Europe and North America, 65 for Latin America, and not quite 50 for Africa. Infant mortality is high throughout much of Asia, especially in South Asia; the overall Asian average is around 100 infant deaths per 1,000 live births. The range is from more than 200 in Afghanistan to levels of 8–12 in Japan, Hong Kong, and Singapore, which are on a par with European countries. Total fertility in the latter 1970s varied from about 2 children per woman in Japan and Singapore to more

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than 6 in Bangladesh, Pakistan, Iran, Afghanistan, Nepal, Laos, and Bhutan.

School enrollment is much lower for girls than boys in much of Asia. Enrollment for girls aged 6–11 is virtually universal in the Soviet Union, Japan, and South Korea, and at least 90 percent complete in Taiwan, Malaysia, Hong Kong, and Singapore; but it is only 10 percent or less in Afghanistan, Nepal, and Bhutan. Enrollment for girls aged 12–17 varies from about 95 percent in Japan and about 80 percent in the Soviet Union and Hong Kong to less than 10 percent in Bangladesh, Pakistan, Afghanistan, Nepal, and Bhutan.

The Chinese-related city-states of Hong Kong, Singapore, and Macao are virtually 100 percent urban, and Japan and Taiwan are more than 75 percent urban; on the other hand, Bangladesh is about 10 percent urban, and Nepal and Bhutan only 5 percent or less. Population density varies from 0.01 persons per hectare in Mongolia and 0.04 in Soviet Asia (0.004 and 0.016 per acre, respectively) to density levels well above those of Europe in Bangladesh, Taiwan, and South Korea to more than 40 persons per hectare (16 per acre) in the city-states of Hong Kong, Singapore, and Macao. Rural population densities per arable land area are very high in a number of Asian countries. Annual rates of population growth in the late 1970s varied from less than 1 percent in Japan to at least three times that in Pakistan, the Philippines, Iran, and Brunei.

Asia includes seven of the world's ten most populous countries (China, India, Indonesia, Japan, Bangladesh, Pakistan, and Soviet Asia in descending order of population), six other large countries with populations of more than 30 million (Vietnam, the Philippines, Thailand, Iran, South Korea, and Burma), and a third group of six countries with populations exceeding 10 million (North Korea, Taiwan, Afghanistan, Sri Lanka, Nepal, and Malaysia). Asia's developed countries, Japan and Soviet Asia (the latter is still developing in some respects), contained 186 million people in 1980, about one-sixth of the earth's developed population. (Soviet Asia refers to the part of the Soviet Union that lies in Asia. Soviet Socialist Republics (SSR's) included are the following: Armenia, Azerbaijan, Georgia, Kazakh, Kirghiz, Tadzhik, Turkmen, Uzbek, and the large area of the Russian Soviet Federated Socialist Republic (Russia) that is east of the Ural Mountains.) [*For more detailed discussion, see* Soviet Union, *which presents information on the SSR's located in Europe as well as those located in Asia.*]

Asia's twenty-six developing countries had more than 2.3 billion people in 1980, 53 percent of the earth's population and 75 percent of its developing population. These twenty-six countries comprise an area larger than Latin America but considerably smaller than Africa. With less than 30 percent of the total area of all developing countries, the twenty-six developing countries of Asia have a population three times as large as that of Africa and Latin America combined.

For demographic purposes it is convenient to divide the twenty-eight countries of Asia into five principal regions. The first region consists of twelve populous countries in southern and eastern Asia with high population density or high agricultural density per unit of arable land. These twelve countries, which alone contain half (49 percent) of the world's population, are, in descending order of population, China, India, Indonesia, Bangladesh, Pakistan, Vietnam, the Philippines, South Korea, North Korea, Taiwan, Sri Lanka, and Nepal. (The Maldives also belongs with this high-density group.) The second region consists largely of countries of the Southeast Asian mainland except for high-density Vietnam: Thailand, Burma, Malaysia, Kampuchea, and Laos. In addition, Brunei is included along with the eastern Malaysian states of Sabah and Sarawak, which occupy the northern part of Borneo. This region contains about 2.5 percent of the world's population. The third region is made up of the Asian highland countries of Iran, Afghanistan, Mongolia, and Bhutan, containing about 1.5 percent of the world's population. The city-states Hong Kong, Singapore, and Macao constitute the fourth group, and the two developed countries, Japan and Soviet Asia, with 4 percent of the world's people, are the fifth.

Such population giants as China, India, Indonesia, Bangladesh, and Pakistan receive separate treatment elsewhere in this work [*see articles on individual countries*] and so are treated more or less collectively here; the same is true for Japan and the Soviet Union. The smaller countries, Kampuchea, Hong Kong, Laos, Singapore, Mongolia, Bhutan, Macao, Brunei, and the Maldives are not presented individually in the general table (Table 1) and treatment that follow, but they are included in the totals for their respective regional groups as defined above.

Densely Populated Southern and Eastern Asia. The large, densely populated nations of southern and eastern Asia have an average population density of four times the world level. Only Indonesia, the least densely populated nation in this region, is less than three times as densely populated as the world average. Actually Java and the two small adjacent islands of Madura and Bali, where two-thirds of all Indonesians reside, have a population density about ten times as high as the Indonesian average shown in Table 1 whereas the large islands of Sumatra, Kalimantan, Sulawesi, and Irian Jaya, and most of the smaller islands are relatively sparsely populated. Because such a large proportion of their land is uninhabitable, both China and Nepal have lower popu-

TABLE 1. *Size, growth rate, density, and rural-urban breakdown for Asia, by regions*[1]

Region	Population (millions), 1980	Annual rate of population growth, 1975–80	Population per hectare, 1980	Rural population per arable hectare, 1980	Percent urban, 1980	Cities over 4 million, 1980	Cities 1–4 million, 1980
Densely populated Southern and Eastern Asia	2,164	1.9%	1.3	4.6	25	11	50
China	940	1.3	1.0	6.0	25	3	26
India	694	2.3	2.3	3.2	22	4	10
Indonesia	153	2.3	.8	6.5	20	1	2
Bangladesh	89	2.9	6.6	8.3	11	0	2
Pakistan	82	3.2	1.1	3.0	28	1	2
Vietnam	52	2.3	1.6	7.3	23	0	3
Philippines	51	3.0	1.7	4.1	36	1	0
South Korea	38	1.8	3.9	7.1	55	1	2
North Korea	18	2.4	1.5	3.4	60	0	1
Taiwan	18	2.0	5.1	2.3	77	0	2
Sri Lanka	15	1.8	2.3	5.5	27	0	0
Nepal	14	2.3	1.0	6.8	5	0	0
Southeast Asian Mainland	109	2.6	.6	2.4	20	1	2
Thailand	48	2.8	.9	2.5	14	1	0
Burma	35	2.4	.5	2.5	27	0	1
Malaysia	14	2.6	.4	1.6	29	0	1
Asian Highlands	63	2.9	.2	1.5	37	1	0
Iran	38	3.0	.2	1.2	50	1	0
Afghanistan	22	2.7	.3	2.2	15	0	0
City-States	8	1.7	46.3	57.8	85	1	1
Developed Asia	186	1.2	.1	.4	76	2	13
Japan	116	.8	3.1	4.5	78	2	4
Soviet Asia	70	c.1.8	.04	.2	71	0	9
Asia	2,530	1.9	.6	3.3	29	16	66
World	4,415	1.8	.3	1.7	41	38	197

[1] Because of differences in sources of data, figures given in this table do not agree precisely in all instances with figures given in other articles in this encyclopedia.
Sources of data. Columns 1 & 2: United Nations, 1979*b*; medium variant was used. Column 3: United Nations, 1979*b*; FAO, 1977. Columns 4–7: United Nations, 1980*a*.

lation densities than most other countries in this group, although they are still three times as dense as the world average, and both have rural population densities relative to arable land that are quite high.

Rural densities relative to arable land are very high throughout this region, especially in Indonesia, Bangladesh, Vietnam, South Korea, and Sri Lanka, as well as in China and Nepal. Agricultural densities are somewhat lower in India and Taiwan than in most of the other countries, but overall densities are quite high. Only Pakistan, the Philippines, and North Korea do not have "excessively high" total or agricultural population densities; even so, total densities in these countries are about four or five times the world average and agricultural densities about twice. Mountains in all three countries, the desert in Pakistan, and a relatively short growing season in North Korea constitute substantial geographic or agricultural barriers.

The population of this region is 75 percent rural, far higher than the world average of 59 percent. North and South Korea and Taiwan are heavily urbanized, unlike other countries in the region. In 1980, China was 75 percent rural, India was 78 percent, and Indonesia 80 percent; Bangladesh was almost 90 percent rural and Nepal 95 percent. Nevertheless, the region as a whole and particularly China and India, because of their sheer size, have enormous urban populations. The urban population of the region exceeded 500 million in 1980, and the twelve countries had eleven of Asia's sixteen and the world's thirty-eight metropolitan areas of more than 4 million. Four Indian and three Chinese cities exceeded that figure. Metropolitan Shanghai exceeded 13 million, Beijing exceeded 10 million, Calcutta, Bombay, and Seoul all exceeded 8 million, and Jakarta exceeded 7 million. This region also had 50 of Asia's 66 and the world's 197 metropolitan areas between 1 and 4 million

in size, including 10 in India and no less than 26 in China. In all twelve countries the urban growth rate exceeds the national growth rate by a considerable amount, and in all twelve it exceeds the world's urban growth rate (2.8 percent per year). Thus, urbanization is a potent force in this region. The overwhelming fact remains, however, that in 1980 these twelve countries had a rural population of more than 1.6 billion, some 62 percent of all the people living in rural areas on the earth.

Population characteristics. Population growth from 1975 to 1980 has been rapid in southern and eastern Asia (1.9 percent per year). This figure is slightly more rapid than that for the world as a whole (1.8 percent), but not so rapid as for the remainder of Asia or for all developing countries (2.2 percent). [*See* FERTILITY AND POPULATION GROWTH.]

Fertility is declining in the region, but it is still high, somewhat above the world level. The latest (1978) United Nations population estimates indicate a total fertility rate of 4.0 live-born children per woman during 1975–1980 for the world as a whole, but 4.4 for eastern and southern Asia. (See Table 2.) From the World Fertility Survey and a variety of other sources, it seems fairly clear that fertility has been declining in China, India, Indonesia, the Philippines, South Korea, Taiwan, and Sri Lanka. This is probably true in North Korea as well, but presently available data are inadequate for a firm conclusion to be drawn. Some evidence suggests the beginnings

TABLE 2. *Total fertility, life expectancy, infant mortality, percentage of population under 15, school enrollment, GNP per capita for Asia, by region*[1]

Region	Total fertility rate, 1975–80	Life expectancy, 1975–80	Infant mortality rate, c.1977–78	% of population under 15, 1980	% of girls of primary and secondary age enrolled in school, c.1976	GNP per capita (US $), c.1978
Densely populated						
Southern and Eastern Asia	4.4	57	c.100	37%	c.45%	350
China	3.1	64	56	32	—[2]	460
India	5.2	52	134	41	40	180
Indonesia	4.9	50	91	42	48	360
Bangladesh	6.7	47	153	46	37	90
Pakistan	7.0	52	142	47	19	230
Vietnam	5.8	48	115	41	90	170
Philippines	5.6	61	80	44	86	510
South Korea	3.5	63	38	34	80	1,160
North Korea	4.5	63	70	40	—[2]	730
Taiwan	2.7	71	25	35	82	1,400
Sri Lanka	3.6	64	42	36	64	190
Nepal	6.5	43	133	42	8	120
Southeast Asian Mainland	5.3	56	c.100	42	52	400
Thailand	5.4	60	68	43	58	490
Burma	5.5	53	140	41	49	150
Malaysia	4.9	61	44	41	65	1,090
Asian Highlands	6.5	52	c.150	45	38	1,400
Iran	6.4	54	112	45	56	2,180
Afghanistan	6.9	43	226	45	5	240
City-States	2.5	71	17	28	77	3,000
Developed Asia	c.2.5	72	c.25	—	c.95	c.5,900
Japan	1.8	75	9	23	97	7,330
Soviet Asia[3]	—	—	—	—	—	—
Asia	4.3	58	c.100	37	c.51	800
World	4.0	58	c.100	35	c.55	2,040

[1] Because of differences in sources of data, figures given in this table do not agree precisely in all instances with figures given in other articles in this encyclopedia.
[2] Data on girls in school were unavailable for China and North Korea.
[3] Data were unavailable for Soviet Asia. Soviet approximations were averaged with data for Japan to obtain the figures given for Developed Asia.
Sources of data. Columns 1 & 2: United Nations, 1979b. Column 3: various sources. Column 4: United Nations, 1980c. Column 5: UNESCO, 1978. Column 6: Haub and Heilser, 1980. Regional totals are the author's calculations.

of fertility declines in Bangladesh and Pakistan, but fertility is still very high in both countries and cannot have declined very much. There is inadequate information on Vietnam; it is possible that fertility has declined in the north but not in the south. There seems not to have been any appreciable fertility decline in Nepal. Fertility declines were greatest in South Korea, Taiwan, Sri Lanka, and apparently in China, for which, however, good national data are lacking. The decline in Indonesia was probably substantial in Java and Bali. In India the obstacles to be overcome seem as impressive as the modest decline to date.

There is little doubt as to substantial decline in the mortality rate throughout the region, but the mortality rate remains high in Indonesia, Vietnam, Nepal, and the South Asian giants—India, Bangladesh, and Pakistan—leaving room for considerable additional decline and therefore continuing high growth rates in these countries. Infant mortality is still well over 100 infant deaths per 1,000 live births in all of these countries except Indonesia, where it had probably fallen a little below that level by 1980. By contrast, infant mortality is down to the vicinity of 40 per 1,000 births in South Korea and Sri Lanka and to about 25 in Taiwan. General mortality is now sufficiently low in South Korea, Taiwan, Sri Lanka, and apparently in China and North Korea so that further declines will probably be modest there.

Economic and social characteristics. Except in the urbanized countries of North and South Korea and Taiwan, income is very low throughout southern and eastern Asia. Even including these three countries, the 1978 per capita GNP in the region was about $350 annually. Internationally this figure is well below the average for Africa (which includes high incomes in South Africa and several North African countries, modest incomes in Nigeria, and low incomes in many countries) and less than one-fourth of the average level for Latin America. Except for Haiti and tiny Dominica, no country in Latin America or the Caribbean had per capita GNP levels as low as those in China, India, Indonesia, Bangladesh, Pakistan, Vietnam, Sri Lanka, and Nepal. Only Haiti, Dominica, and Honduras had per capita GNP levels as low as in the Philippines, the next most prosperous of the eastern and southern Asian group after the two Koreas and Taiwan. Given China's broad societal reconstruction, outright poverty is presumably not very common there, but both poverty and bare subsistence farming are certainly widespread throughout the remainder of the southern and eastern Asian countries. Thus, with an occasional exception, the twelve countries in this region are characterized by large, poor, rural populations supported by subsistence agriculture; high population density and high rural density relative to arable land; rapid popula-

tion growth; high, though in recent years diminishing, fertility; and decreasing mortality.

There are problematic social conditions as well as difficult economic and demographic circumstances. For example, illiteracy is common in South Asia and Indonesia. The most recently available UNESCO figures indicate that in 1976 less than half of the girls of primary and secondary school age (approximately 6–17) were enrolled in school in India, Indonesia, Bangladesh, Pakistan, and Nepal. Figures are unfortunately not available for China. Enrollment of girls was less than 20 percent in Pakistan and less than 10 percent in Nepal. The average for ten southern and eastern Asian countries, excluding China and North Korea, for which data are not available, was 45 percent. These figures represent discrimination against women, which has been traditional in much of this region until quite recently and continues to be a problem, as well as illiteracy; and in a sense they measure the extent of the campaign against illiteracy rather than illiteracy itself. Nevertheless, they illustrate the problem of large numbers of youth, particularly girls, with poor educational skills, who are not in school.

Large, dense, rapidly growing, low-income rural populations with insufficient arable land and massive literacy and educational problems: this is the situation of a large proportion of the 2.2 billion people in these twelve countries. These are also the dimensions of the more or less "classic population problem" involving heavy and increasing population pressure, low income, scarce resources, and meager means of subsistence, which, at least in the short run, are severely limiting. "Population problems" are of many kinds; in a sense each country has its own. They concern a variety of complicated interactions among fertility; mortality; migration; the size, composition, and distribution of populations; and available resources and technology. Diagnoses and indicated solutions also vary with problems and with politics. This description does not fit the developed world; it does not fit Africa or Latin America or the Arab countries of the Middle East so well, although aspects of it are applicable to many African and Latin American countries. Its applicability to Thailand and the other mainland Southeast Asian and Asian highland countries is limited. But the conditions described constitute a pervasive fact of existence for hundreds of millions of peasant families in China, India, Indonesia, Bangladesh, Pakistan, Vietnam, the Philippines, and the other countries in this region.

Policy and action. The fundamental reality of population conditions formed the backdrop for the development of population policy in southern and eastern Asia in the 1950s and 1960s, which to a considerable extent transcended widely differing governmental systems, political ideologies, religious teachings, traditional cultures, and

ethnic groups. The economic and social development of low-income countries involves complicated processes and difficult social transformations under the best conditions. Given large, dense, rapidly growing, youthful, rapidly urbanizing but predominantly rural populations with growing needs for food, shelter, employment, and basic social services, conditions for development were not optimal in most of these countries.

Many national economic, health, and social planners felt that socioeconomic development would be difficult enough without the added drag on struggling economies of rapidly growing number of children, associated with high fertility, and their needs for food, shelter, education, and eventually jobs, when unemployment and underemployment were already widespread. India in the early 1950s and Sri Lanka and China in the middle 1950s were the first countries in this region and the first in the world to initiate population policies designed to reduce the threat to the prospects for development posed by rapid population increase of an already dense population. Since a continued high mortality rate was unacceptable and migration on the scale needed was impractical, if not impossible, fertility had to be reduced. Migration to the less densely populated Outer Islands has been an important population policy issue in Indonesia. Regulating the rate of urbanization, which partially alleviates rural population pressure on the one hand but helps cause another range of population-related problems on the other, has been an issue in China and a number of other countries. There might still be population growth, but if the rate could be lessened, the drag on development could be minimized.

Family planning programs. India and China initiated national family planning programs to try to lower the birth rate and to slow population growth. Sri Lanka supported a program sponsored by a private family-planning association with funds and clinical space in government medical facilities. Taiwan, Pakistan and Bangladesh (politically united at that time), South Korea, and North Vietnam (then politically separate from South Vietnam) followed in the early 1960s, as did Nepal and Indonesia during the middle 1960s and South Vietnam and the Philippines in the later 1960s. By the close of the decade every country in this region with the exception of North Korea, which has never endorsed family planning, and the tiny island Republic of Maldives, which endorsed family planning in the latter 1970s, had adopted family planning policies. In every instance except South Vietnam and subsequently the Maldives, the primary rationale for family planning was demographic, a response to the stark demographic realities described earlier: the national population growth rate and birth rate needed to be reduced. Unlike many of today's family planning programs in Latin America, Africa, and elsewhere in Asia, population control was and remains paramount in this region, rather than maternal and child health or human rights.

Population and family planning policies in the largest countries—China, India, Indonesia, Bangladesh, and Pakistan—are discussed elsewhere in this work [*see articles on individual countries*]. Further discussion here is limited to brief comments on the family planning programs in the Philippines, South Korea, and Taiwan. Considerably more information is available on these than on most other programs. They are among the best-evaluated, best-researched programs in the world; all have active evaluation units and experienced research and evaluation staff at work. All three feature a broad mix of contraceptive methods: intrauterine devices (IUD's), oral contraceptives, condoms, and male and female sterilization. Sterilization has grown in popularity in all three countries among provider agencies and among the public during the latter 1970s, in large measure because of simplifications and improvements in technology; the upsurge in South Korea has been particularly notable. The Philippines is unusual in offering rhythm as a major program method, while South Korea is one of only a few countries that have incorporated abortion into their networks of family planning services. In South Korea and Taiwan the commercial sector is active in providing contraceptive supplies and accounts for a major proportion of contraceptive use. Private doctors are also very active in both countries. They insert most of the IUD's and perform many of the male and female sterilizations provided by public programs, working on a fee-for-service basis paid by the government. They also perform large numbers of sterilizations through private practice. Abortion under good medical conditions in the clinics of private doctors is widely used, legally in South Korea and openly but not legally in Taiwan.

The Filipino program features about 40 different provider agencies and 3,500 clinical sites all coordinated by the Commission on Population, through which financial support flows. There has been a gradual evolution from an initial clinic-based program to one with greater emphasis on community outreach and increasing responsibility for contraceptive distribution by paraprofessional providers.

The South Korean program has long included broad distribution of condoms and oral contraceptives by nonmedical township field-workers, both in home visits and through village Mothers' Clubs, which tie family planning to community development. The Korean and Taiwanese field-workers recruit people who will accept IUD's and sterilization and are paid a small incentive fee for each recruit. Both countries have strong target sys-

tems; field-workers have numerical goals for recruitment each month.

In Taiwan, program administration is tight and supervision strong. Township field-workers achieve targets through a point system that gives greater weight to more effective methods and recruitment of younger people but retains flexibility at the local level. Taiwan's excellent vital statistics have facilitated evaluation and have been exploited to send special mailings to postpartum women and to newly married couples. Both operational studies and more basic social demographic research have been exceptionally good in Taiwan. Taiwan and South Korea have utilized "Stop at Two" campaigns, and both countries and the Philippines have experimented with a variety of incentives and disincentives for family planning, but none on the scale of China or Singapore. None has used social and community pressure as effectively as have China and Indonesia. Despite strong preference for sons, Taiwan and South Korea have experienced large and well-documented fertility declines. Fertility is also beginning to decline in the Philippines.

Southeast Asian Mainland. The high-density conditions that characterize the huge populations of southern and eastern Asia are not nearly so prevalent in Thailand, Burma, Malaysia, Kampuchea, Laos, and Brunei. Population densities for these countries are not low, averaging twice the world level, but are only half as great as those of the southern and eastern Asian group. Likewise rural density relative to arable land is well above the world average but only half that of the southern and eastern Asian countries. However, many other demographic and socioeconomic conditions facing Thailand and its neighbors are similar to those facing China, India, Indonesia, and their neighbors. In the Southeast Asian peninsula, fertility is high; women bear an average of 5.3 children during their reproductive years, one more than the average for southern and eastern Asia. Mortality has fallen, although it is still very high in Burma, Kampuchea, and Laos. Infant mortality is well over 100 per 1,000 live births in these countries and averages about 100 for the region, roughly equal to the level for southern and eastern Asia. Average population growth of 2.6 percent per year is well above the 1.9 percent for southern and eastern Asia and the 1.8 percent world average. These countries have only one city of 4 million, Bangkok, and only two others of 1 million, Rangoon and Kuala Lumpur. Only 20 percent of the 109 million people in the region live in cities, compared to 25 percent in southern and eastern Asia. For example, Thailand, the largest country, is substantially less urbanized than China, India, Indonesia, or Pakistan, and only slightly more than Bangladesh.

Except for Malaysia and Brunei, the Southeast Asian countries are very poor. Thailand had a 1978 per capita GNP of about $500, comparable to China and the Philippines, but in Burma the figure was only $150, and in Kampuchea and Laos it was less than $100, as in Bangladesh. About half of the girls of primary and secondary school age are enrolled in school, somewhat more than in the southern and eastern Asian countries; but enrollment in Kampuchea and Laos, which have both been disrupted by civil war, has been extremely low.

Despite rapid population growth and low income, most of these countries have not committed themselves to family planning. The exceptions are Malaysia, which began to develop a national family planning program in the middle 1960s, and Thailand, which did so in the later 1960s. The Thai and Malaysian programs have a demographic rationale, but the health rationale is probably about equally important. Kampuchea and Laos initiated programs in the early 1970s, but both were closed down a few years later by new governments. Burma is the largest country in the developing world not to have endorsed family planning, and there is no public program in Brunei. As of 1980, governments in Burma, Kampuchea, and Laos were all pronatalist, and the latter two in particular are encouraging population growth.

Fertility has been declining in Thailand and Malaysia and is fairly low in Brunei. There is no evidence of a decline in fertility in Laos. Fertility was very high in Kampuchea prior to the civil war but may have taken a sharp drop since; this drop, however, may be only temporary and is probably a function of the war and related hardships rather than the beginning of a societal transition to smaller families.

The Thai family planning program has generated considerable international interest. Female sterilization has been one of the major methods, and pioneering medical research has been carried out on postpartum sterilization and immediate postpartum IUD insertion. Considerable research on the injection of Depo-Provera has been conducted in Thailand, which is the leading country in the world in experimentation with and use of this method. An extremely rapid upsurge in the use of oral contraceptives occurred when it was decided to allow trained auxiliary midwives to prescribe them in local health centers. The national program is now heavily dependent upon this method. This step was significant in Thailand and internationally in the movement away from the restricted reach of clinic-based programs toward broader and more liberal distribution of contraceptives within or closer to the villages where much of Thailand's, and the world's, population resides. Another interesting feature of the Thai program has been the rapid development of the Community Based Family Planning Services organization (CBFPS), which complements the national pro-

gram. A conservative rural population has responded warmly to the aggressive and imaginative marketing and communications strategy of CBFPS, which has helped to destigmatize the condom in particular and family planning in general.

Asian Highlands. Iran, Afghanistan, Mongolia, and Bhutan constitute the Asian highlands group. These countries had a 1980 population of 63 million, about 1.5 percent of the world's population. In none of these countries is population density above the world average, and in the region as a whole the density of rural population relative to arable land is below the world average. Population density in Mongolia is among the lowest in the world, 0.01 persons per hectare (0.004 per acre), only one-fourth of the level of Soviet Asia.

Fertility is quite high; women in the region bear 6.5 children on the average. Mortality is also very high; life expectancy is about 52 years, about five years less than in the regions previously discussed. Figures on infant mortality are not at all secure, but the rate is very high, averaging about 150 per 1,000 live births, 50 percent higher than in southern and eastern Asia and Southeast Asia. Infant mortality exceeds 100 in all the countries except, perhaps, Mongolia, and exceeds 200 in Afghanistan, where it is among the highest in the world. Annual population growth (2.9 percent) is higher than in Southeast Asia (2.6 percent) and much higher than in the large, densely populated countries of southern and eastern Asia (1.9 percent) or the world average (1.8 percent). It may well rise further if mortality comes under more effective control. Iran and Mongolia are moderately urbanized with about half of their populations living in cities; Afghanistan and Bhutan are almost entirely rural. The region as a whole is 37 percent urban, much more than the two regions discussed previously. The city of Teheran exceeds 5 million.

Afghanistan and Bhutan have a very low per capita GNP but the figure is moderate in Mongolia ($900) and above the $2,000 world average in oil-rich Iran ($2,200). Rural-urban differences are quite pronounced in Iran. School enrollment is extremely varied; enrollment of girls of primary and secondary school age approaches universality in Mongolia (91 percent), is moderate in Iran (56 percent), but is only 5 percent or less in Afghanistan and Bhutan. For the region as a whole only 38 percent of the girls of school age are enrolled, and illiteracy, especially female illiteracy, is a problem except, perhaps, in Mongolia.

Iran in the mid-1960s and Afghanistan in 1970 adopted family planning policies, but in neither of these countries has the program been especially effective. Large proportions of the rural populations remain without access to modern family planning services. Neither Bhutan nor Mongolia has a family planning program; Mongolia is pronatalist but has moved to allow family planning on health grounds on a very limited basis. Fertility remains very high in this region as noted above.

City-States. The demographic situation of Hong Kong, Singapore, and Macao differs radically from that of all other Asian countries. Population density is, of course, extreme in these essentially metropolitan countries. Hong Kong had a population of 4.8 million in 1980, and Singapore had half that. Macao was approaching 300,000. Rates of population growth are moderate, below those of the other developing countries of Asia and below the world average. Low growth rates reflect the extent of immigration controls and low fertility. Singapore was the first developing country to achieve replacement-level fertility in 1975, and it has stayed below that level since. Fertility in Hong Kong is only a little above replacement level. These rates fell from much higher levels a generation earlier. Mortality is very low in Hong Kong and Singapore; life expectancy is a little over 70 years, and infant mortality is less than 20 per 1,000 live births. The per capita GNP in these countries exceeds $3,000, and enrollment of girls of primary and secondary school age is nearly 80 percent.

Family planning programs. Hong Kong and Singapore have had strong and effective family planning programs since the 1950s. Clinical services and informational-educational promotion are excellent in both countries. Both offer a variety of contraceptive methods and considerable reliance on female sterilization. Unlike in the large rural countries, clinical services are accessible to most of the population. Abortion is legal in both countries and is common in Singapore, apparently less so in Hong Kong. Both countries have stressed campaigns of "Stopping at Two." Singapore has an excellent telephone information service to respond anonymously to questions on family planning and related subjects. Knowledge of family planning methods has reached high levels in both countries, and more than 70 percent of married women of reproductive age are currently practicing family planning. Both countries have dependable vital statistics.

An interesting feature of the program in Singapore is the series of disincentive measures adopted by the government to complement the strong family planning program (see Chen and Fawcett, 1979). Delivery and antenatal visit fees increase and income tax deductions decrease for higher-order pregnancies or births, but the delivery fee is waived if the mother undergoes sterilization after delivery. Maternity leave is not available after the first two births. Sterilization leave for seven days with full pay is available to both men and women. Sterilization and abortion services are heavily subsidized and available on a request basis. Larger families are no longer

given priority in securing much-sought government housing, and smaller families are permitted to sublet rooms if they wish. First and second children are given priority in school selection if one parent has been sterilized before age 40 and before the birth of a third child; third and higher-order children are given lower-level priority if a parent has been sterilized before age 40. These policies are widely known in Singapore and are believed to have had a substantial educational impact and to have helped encourage the trend toward smaller desired family size; they are not believed to have had a strong impact in directly preventing births when parents wanted an additional child. With a combination of a strong family planning program, the disincentives, and rapid socioeconomic development, Singapore in 1975 became the first developing country to attain replacement-level fertility, as noted above.

Developed Countries. From a demographic point of view, Japan and Soviet Asia have relatively little in common except that they are economically developed. They vary greatly in size, density, rate of population growth, degree of ethnic heterogeneity, and range of population issues that are considered most pressing. Both are discussed individually in depth elsewhere in this work [*see* JAPAN; SOVIET UNION] and are given only passing mention here to round out the total picture of Asia.

Parts of Japan are among the most densely populated regions on earth, while Soviet Asia is among the least densley populated. Both countries are highly urbanized, and the urban population constitutes more than three-fourths of the total population of the region. The Tokyo-Yokohama metropolitan complex has a population of 20 million, second in the world only to Greater New York. The Osaka-Kobe metropolitan complex ranks twelfth in the world with upward of 9 million people. Japan has four other cities over 1 million, and Soviet Asia has nine. Mortality and infant mortality in both countries are low, and life expectancy for the region exceeds 70 years. School enrollment at the primary and secondary levels is approaching universality in both countries, and the sharp enrollment differences by sex that are prevalent in most of the other Asian countries are missing. Income is high, but it is much higher in Japan than in Soviet Asia. Fertility is well below the replacement level in Japan. Fertility is also quite low in the Soviet Union, but it is much higher in Soviet Asia than in Russia, the Ukraine, Byelorussia, and the other European republics, where it has dropped below the replacement level. Neither country has a national family planning program in the sense that the developing countries do, but services are available through the medical systems. Abortion services have long been legal, broadly available, and extensively used in Japan and the Soviet Union.

Scholarly Activities. Major research activities are carried out in most Asian countries with large populations [*see* BANGLADESH; CHINA; INDIA; INDONESIA; JAPAN; PAKISTAN; SOVIET UNION]. The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) trains personnel in population and population-related fields and organizes seminars and working groups on family planning and population and development planning topics. It has published a *Directory of Key Personnel and Periodicals in the Field of Population,* a *Directory of Institutions Engaged in Research, Teaching, and Training in Demography,* and the quarterly *Asian and Pacific Population Programme News.*

Among the smaller countries, Korea and Taiwan have conducted many demographic studies and have sponsored much research related to their family planning programs. The Value of Children project begun in 1972 has produced considerable information on childbearing motivation and family size limitation in seven Asian countries: Japan, Korea, the Philippines, Taiwan, Thailand, Indonesia, and Singapore. [*See* VALUE OF CHILDREN.] Numerous other special studies have also been carried out, including ones on recent mortality levels and on trends in internal migration.

The Philippines, South Korea, and Thailand all have government or university institutions engaged in population research. In Thailand, the Institute of Population Studies at Chulalongkorn University has been designated by the government as the focal point for population studies, the Population Institute of the University of the Philippines is also prominent. In Singapore, demographic research is carried out through the Institute of South-East Asian Studies. Strong collaborative ties have developed in particular between several Southeast and East Asian countries and researchers at the East-West Population Institute in Hawaii and the Department of Demography of the Australian National University. Numerous population-related regional and subregional organizations exist.

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Many articles in this work give information about countries in the Asian region. On fertility and fertility control, see especially WORLD FERTILITY SURVEY; CONTRACEPTIVE USE, *article on* DEVELOPING COUNTRIES; FAMILY PLANNING PROGRAMS; FERTILITY AND POPULATION GROWTH. *See also* AGE AT MARRIAGE.

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ASSISTANCE PROGRAMS

See INTERNATIONAL POPULATION ASSISTANCE.

ASSOCIATION FOR POPULATION/FAMILY PLANNING LIBRARIES AND INFORMATION CENTERS—INTERNATIONAL

The Association for Population/Family Planning Libraries and Information Centers—International (APLIC) was created to help develop information and library systems and services in the field of population and family planning. Its purpose is also to enhance the worldwide transmission of information on all aspects of population, demography, and family planning. Included in APLIC's membership are population organizations represented by such diverse specialists as professional librarians, documentalists, demographers, statisticians, and physicians.

APLIC was founded in 1968 at the First National Conference on Population and Information Sciences held at the Carolina Population Center, Chapel Hill, North Carolina. The general intent of the new organization was to improve information-handling techniques, to devise new systems for manual and computerized information storage and retrieval, and to develop more efficient methods for processing the growing volume of population information.

The organization stated as its goals: (1) professional development of effective documentation and information systems and services in the field of population and family planning; (2) professional contact among population documentalists, librarians, and information and communication specialists; (3) worldwide exchange of population information through international programs and activities; (4) an international cooperative network of population documentation, information, and library facilities for the exchange, dissemination, and communication of population information; and (5) continuing education to encourage professional development among population documentalists, librarians, and information and communications specialists.

At the time APLIC was founded, population and family planning literature stood in need of reorganization. None of the leading library classification systems (including the Dewey Decimal System) contained categories that adequately covered the diverse nature of population literature. In response to this need, APLIC's members published classification schemes, produced thesauri, and developed local systems of literature organization and control. [*For descriptions of these works, see* PUBLICATIONS, *article on* BIBLIOGRAPHIC RESOURCES.] By 1981 the task of developing adequate systems for organizing the population literature was as yet incomplete and continues to receive attention from APLIC members.

The APLIC annual conference concentrates on some topic of timely importance, holds sessions on continuing education, advances professional development, and increases professional contacts. Publications include proceedings of APLIC's annual meeting; a union list of population and family planning periodicals, which identifies holders of each publication; a list of holding libraries of national population censuses; a guide to population and family planning information sources; and a guide to indexing and abstracting services in population information.

A series of APLIC projects has increased international contacts among population documentalists. In Bangkok, Thailand, in 1973, APLIC and the Carolina Population Center, in association with the Economic Commission for Asia and the Far East (ECAFE), conducted a ten-day working meeting on Resources for a Population Information Network in Asia. Following this seminar, a two-day Population Library Development Institute was convened. It was attended by more than 125 information specialists representing thirty-two institutions from twelve Asian countries, out of which grew an informal association of Southeast Asian population documentalists. At a follow-up seminar in 1979, more formal ties were developed among Asian documentalists and the groundwork was laid for an Indian chapter and a Southeast Asia chapter (ASEAN).

Similarly, in Latin America, a workshop held in 1976 for librarians and information specialists also resulted in the establishment of a regional association: Asociación Interamérica de Centros de Información de Población (AICIP). Subsequently, a Latin American chapter of APLIC was founded in 1980.

In addition to these workshop projects and in keeping with APLIC's goal to facilitate worldwide information exchange, APLIC set up a library during the 1974 World Population Conference. The materials collected for this library were later donated to the United Nations Demographic Research and Training Center in Bucharest, where they serve as a basis for the Center's population library.

Realizing the need for population materials that are not readily available in developing countries, APLIC inaugurated a duplicate book exchange program (DUPs). Begun in December 1977, DUPs was designed both to help establish new collections and to fill gaps in existing collections throughout the world.

A significant achievement for APLIC came about when the United Nations Fund for Population Activities (UNFPA) decided to grant the organization nongovernmental status. The decision reflected UNFPA's support to APLIC's efforts to assist population information specialists in developing countries. By 1980, 47 of APLIC's 159 members were from outside the United States. Because of its international interests, APLIC has joined the International Federation of Library Associations.

Kathryn H. Speert

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AUSTRALIA

See OCEANIA.

B

BANGLADESH

Bangladesh is a predominantly agricultural country located in South Asia. The population, according to the census taken in January 1981, was nearly 90 million. The density of population is one of the highest in the world, and the currently estimated rate of population growth of 2.7 percent per year places Bangladesh among the faster-growing countries of the world. The 1980 per capital income of US$90 was among the lowest in the world. A high rate of population growth combined with less than proportionate increase of arable land has increased the ratio of persons to land from 85 persons per hectare (34.4 persons per acre) in 1960 to 89 persons per hectare (36 persons per acre) in 1974. At the end of the 1970s the proportion of the population living in poverty was in excess of 70 percent (poverty being defined as a level of expenditure less than sufficient to buy daily food equivalent to 2,100 calories—45 grams protein). Even under the extremely optimistic assumption that a net reproduction rate (NRR) of 1 will be reached in the year 1990, the total population of Bangladesh is projected to be 122 million by the year 2000.

Location and Description. Bangladesh, formerly a part of British India, constituted one of two wings of Pakistan from 1947 to 1971. It emerged as an independent country 16 December 1971, when it separated from West Pakistan following a war of liberation. Although Bangladesh is a newly independent country, its history goes back several thousand years. Over these years it has been the meeting place of various races and nationalities including Aryans, Dravidians, Mongolians, Arabs, Persians,

Turks, Abyssinians, Afghans, and Mughals. The population of Bangladesh is a mixture of these races and nationalities. The country lies between 20.75° and 25.75° north latitudes and 88.30° and 92.75° east longitudes, bordered by India and Burma. To the south lies the Bay of Bengal. The land of Bangladesh is low and flat, composed primarily of alluvial soil washed over by a network of three rivers, the Ganges, the Brahmaputra, and the Meghna. Most of the country is less than 12 meters (39 feet) above sea level. It has a tropical monsoon climate with an average annual rainfall of about 75 inches (29 centimeters). There is considerable regional variation around this mean, with 80 percent of this rainfall concentrated in the season June–October. The people of Bangladesh are affected by frequent natural calamities such as drought, flood, and severe cyclonic storms that may include tidal surges—all of which take heavy tolls of human lives and destroy crops and other forms of property.

Agriculture is the most important activity in terms of its contribution to the gross domestic product (GDP) and to employment. It accounts for about 60 percent of the GDP and employs more than 70 percent of the total labor force. One crop, rice, predominates, taking up about 80 percent of the total crop area. Agriculture is practiced primarily on a subsistence level. Therefore, the well-being of the majority of the population is linked to the condition of the rice crop. Important cash crops are jute, sugarcane, and tobacco.

Population Characteristics. The evolution of the economy of Bangladesh over successive historical epochs had some bearing on various characteristics of the popula-

tion. The British policy of deindustrialization of the In-
dian subcontinent in the late eighteenth and nineteenth
centuries in favor of specialization in such export crops as
indigo, jute, and tea, effectively slowed down the growth
of commercial centers and defused an emerging trend
towards diversification of the economy. Society in Bang-
ladesh remained basically rural with high birth and
death rates. Expansion of jute cultivation led to a shift of
population to the central zone of the country. The spread
of high-yielding rice varieties seems to have led to a shift
of population from high- and medium-density areas in
the central and southern zones of the country to lower-
density areas along the border with India.

While mortality has steadily declined, economic and
social conditions in rural areas seem to have helped accel-
erate the population growth rate since the 1930s by en-
couraging a high level of fertility. It seems that increasing
poverty, insecurity of land tenure, declining farm size,
seasonality of employment, and susceptibility to natural
disasters have increased the fertility rate more than other
forces have depressed it. There is some evidence that
rural households opt for a relatively large family. The
sharecropping system in Bangladesh, which emerged in
the wake of the Permanent Settlement of Land by the
British in 1793, may have provided an economic motive
for a family to have more children so as to be able to lease
more land. In the absence of earning opportunities out-
side agriculture, landless households require more earn-
ing members to smooth fluctuations in the consumption
stream during lean seasons. Over the years in many parts
of the country, village society has become faction-ridden
and disputes have often led to violent physical conflicts.
Since policing forces are virtually nonexistent at the vil-
lage level, only a large faction or family could provide
security. Such cultural factors as almost universal mar-
riage and marriage at a relatively young age have helped
maintain the bias toward high fertility.

Size, area, density. The first population census of inde-
pendent Bangladesh enumerated 71.5 million people as
of 1 March 1974. A postenumeration check (PEC) survey
indicated underestimation of 6.88 percent (19.3 percent
for four major cities and 6.5 percent for the rest of the
country), giving an adjusted population figure of 76.4
million. According to the estimated mid-year population
in 1974, Bangladesh ranked eight in population size in
the world. With a surface area of 143,998 square kilome-
ters (55,598 square miles), the density per square kilome-
ter was 531 persons (1,375 per square mile). This density
was the highest in Asia and the highest among the fifteen
most populated countries in the world.

Number of households and of women in reproductive age.
The 1973 housing census put the total number of house-
holds in Bangladesh at 12.6 million. This represented an

increase of 32 percent over the number in 1960. In rural
and urban areas the number of households increased by
27 percent and 112 percent respectively between these
two censuses. In 1973, rural areas accounted for 91 per-
cent of total households. The average household size in
rural and urban areas was 5.9 and 6.1 persons respec-
tively. For the country as a whole, the average household
size went up from 5.3 in 1960 to 5.9 in 1973. Of the total
population 29.1 million, or 38.1 percent, were women of
reproductive age—that is, in the 15–44 age group. This
proportion was 40.3 percent in 1961. The child-woman
ratio has declined from 937 in 1961 to 922 in 1974.

Labor force and dependency ratio. The population
above 10 years of age was included in the labor force in
the 1961 and 1974 censuses. There is some problem in
comparing labor force data from earlier censuses because
of changes in definition and coverage. In 1974 the total
civilian labor force was 20.5 million. Between 1961 and
1974, the labor force grew at an annual compound rate
of 1.2 percent. The rate of participation in the labor force
declined significantly, from 34.3 percent in 1961 to 28.7
percent in 1974. This is largely explained by a fall in the
rate of female participation in the labor force. While
there may have been a real decline in the labor force
participation rate during this period, at least a part of the
fall is explained by the underestimation of the house-
wives category in the 1961 census and overall under-
enumeration of the 1974 census. In any event, in both
periods, the total labor force participation rate for Bang-
ladesh was well below the average for less-developed re-
gions (which was 39.5 percent in 1960 and 37.5 percent
in 1970). The male rate of participation was 53 percent
in 1974, and the female rate was only 2.5 percent. For
both sexes together as well as for each sex separately, the
rate of participation was higher in urban areas than in
rural areas. In 1974, the total rate of participation in the
labor force was 32.2 percent for urban areas and 28.4
percent for rural areas. For the total population, the 1974
census reveals an age-specific labor force participation
profile shaped like an inverted U, which was to be ex-
pected. The highest rate of participation, 55.5 percent,
occurred in the 45–54 age group.

In comparison with other regions of the world, Bangla-
desh has a very high dependency ratio (the proportion of
dependents to those of working age). This ratio increased
from 98 in 1961 to 105 in 1974. The dependency ratio for
all less-developed regions in 1974 was estimated at 80;
the corresponding figure for more developed regions was
only 57.

Sources and reliability of data. The principal source of
demographic data in Bangladesh is the population cen-
sus. In the Indian subcontinent the first population cen-
sus was taken in 1872. Beginning in 1881, a population

census was taken once every ten years. In independent Bangladesh, the first census was held in 1974, since there was no census in 1971 because of the war of liberation. While there have been some improvements over the years, the basic data generated by the census have remained of mixed quality. The major problem is that the census attempts to collect more information than is feasible given the technical and administrative capability of the census organization and the ability and willingness of the people to respond adequately to census questions. There are other problems too. In the 1941 census, the total population of Bangladesh was inflated for political reasons. It is suggested that the last three censuses, those of 1951, 1961, and 1974, failed to provide an accurate estimate of the total population because of undercoverage. Attempts undertaken in 1961 and 1974 to evaluate the census in terms of coverage through postenumeration checks (PEC) were not altogether successful. These checks were less exhaustive than was desirable, although the 1974 PEC was perhaps more useful than the earlier one. There is also the problem of whether appropriate concepts were used to collect data on items such as literacy and employment.

The system of vital registration in Bangladesh is defective. Data generated by it are not considered reliable enough to reflect demographic trends. Special surveys have been carried out in the past to generate countrywide demographic data. Statistics on birth and death rates were collected under a project called the Population Growth Estimation (PGE), which covered the period 1962–1965. This project was jointly undertaken by the Central Statistical Office (CSO) of the government of Pakistan and the Pakistan Institute of Development Economics, Karachi. The PGE was devised to provide an alternative basis for obtaining movement of vital rates where vital registration systems were inadequate. It has been the only basis for obtaining estimates during the intercensal period. All population projections made in the 1960s were based on the findings of the PGE. Another sample survey, the National Impact Survey, was conducted in 1969 to collect data on fertility behavior and responses to family planning services. Fertility and mortality information was collected through the Bangladesh Retrospective Survey of Fertility and Mortality (BRSFM) carried out in April 1974. Yet another survey called the Bangladesh Fertility Survey (BFS) was carried out in 1975 as part of the World Fertility Survey. Since the early 1960s, quarterly surveys of the labor force have been carried out to collect data on economic activities. While there may be some reservations on various aspects of the surveys mentioned above, the data generated were of better quality than census data in terms of indicating demographic trends.

Age and sex structure. Between 1961 and 1974, the sex ratio for Bangladesh remained unchanged at 108 men for every 100 women. The same was true for rural areas. In urban areas the sex ratio fell from 149 in 1961 to 129 in 1974, probably due to the migration of women to cities to join their husbands. The sex ratio at birth is about 105 in Bangladesh. There is some evidence that in the early years (0–10) the ratio of men to women declines with age, while the opposite is true for ages beyond 60. These relationships can be explained in terms of relative levels of male and female mortality in the age groups mentioned above.

Bangladesh has a relatively young population. The median age of the population is 15.9 years while the mean age is 21.5 years. In 1974, 48 percent of the population was under 15. The corresponding figures for less-developed regions and more-developed regions were 41 percent and 28 percent respectively. The proportion of children under 5 was 17 percent in 1974. The male and female age pyramids are not much different. Age distribution did not change significantly between 1961 and 1974. The large urban areas gained significantly in working-age people of 15–44 as a result of internal migration in the intercensal period 1961–1974.

Fertility, mortality, migration. The crude birth rate (CBR) and crude death rate (CDR) calculated from census data provide some indication of long-term trends (if any) in fertility and mortality. With some fluctuations the CDR declined from 46 in 1901–1911 to 19 per 1,000 in 1961–1974. But as in many other less-developed countries, the birth rate did not experience any such decline in Bangladesh. Census data show that the CBR declined from 54 per 1,000 in 1901–1911 to 47 per 1,000 in 1961–1974, a very modest decline in comparison with the CDR.

Figures from censuses and various special surveys place the current CDR at around 19 and life expectancy at birth at 46 years for both males and females. Over the last two decades there has been no appreciable improvement in life expectancy in Bangladesh. Death rates increased significantly during two contemporary disasters (the 1971 war of liberation and the 1974 famine). Mortality risks varied with economic status. Survey data from a rural area showed that in 1974 the CDR among landless households was three times as high as among those owning more than three acres. The infant mortality rate is high. In 1974 it was estimated from the BRSFM to be 153 per 1,000 live births. Estimates from other surveys indicate that there has not been any improvement since the early 1960s.

Bangladesh continues to experience a high level of fertility although there is some evidence of a decline in age-specific and total fertility rates between the early 1960s

and mid-1970s. Estimates of total fertility rates from the Population Growth Estimation, 1962–1965 (Pakistan, n.d.), and the Bangladesh Fertility Survey (1975) show a decline from 7.3 to 6.6 (Bangladesh, 1978). The decline in total fertility, however, occurred mostly over the 1960s. This trend was not continued in the 1970s. In Bangladesh, a high level of fertility is observed uniformly across all socioeconomic groups and regions. Nevertheless, given that Bangladesh is basically a society that does not use contraceptives, the fertility levels could be higher than what is observed. A number of factors are said to depress natural fertility. These are long periods of postpartum amenorrhea, separation of women from their husbands through occupational migration, and secondary sterility among women of reproductive age.

Net external migration has had a depressing effect on the rate of population growth in Bangladesh since 1911. However, the impact of net migration on population growth has varied from decade to decade depending on the sociopolitical and economic environment that induced such movements of population. It is estimated that during the decade 1951–1961, net migration reduced natural population growth by 12 percent. Independent Bangladesh can probably be considered to be closed to external migration. From census data one can estimate lifetime migrants, defined as persons enumerated in a place different from their place of birth. The proportion of lifetime migrants (including both internal migrants and immigrants) in the total population increased from 2.3 percent in 1951 to 3.5 percent in 1961 and then there was a slight decline in 1974 to 3.4 percent. Net out-migration from 1941–1951 was 1.9 million, the bulk at the time of partition from India. Over the years low-density districts and districts with growing economic opportunities gained population through lifetime net migrants from high-density districts located in the central zone of the country. Lifetime net migration contributed more to the growth of all major urban areas than natural increase of the urban population.

Growth history. The population of Bangladesh rose from 23 million in 1872, when the first census was taken, to 33 million in 1921, an increase of 10 million in fifty years, which is a rate of .74 percent annual growth. The population increased by about two and one half times in the next fifty years. From the beginning of the twentieth century, the decennial growth in population fluctuated somewhat, although there is evidence of acceleration in the growth rate since 1931. The annual growth rate was under 1 percent before 1931, exceeding that level in the decade 1931–1941. The absolute size of the population fell between 1941 and 1951. (The fall is explained by alleged inflation of the 1941 figure and by external migration at partition.) However, if the 1941 figure is ad-

justed, then the annual growth rate becomes 2.9 percent for 1941–1951, representing a significant jump over the previous decade. Again, derived from the adjusted census figures, annual growth rates are estimated at 2.7 percent in 1951–1961 and 2.5 percent in 1961–1974.

Age at marriage. Marriage is almost universal in Bangladesh. The proportion of those never married in the total population is less than one-tenth of 1 percent. The average age at marriage is low. Over 90 percent of women marry before the age of 20. Men marry much later. Ninety percent of men are married by their early thirties. Estimates of singulate mean age at marriage from different sources range from 15.9 to 16.5 for women and 24.0 to 24.9 for men in the mid-1970s. Data from the 1950s and 1960s indicate that the age of marriage for both males and females has increased about a year and a half. Marriage of young girls (before 15) declined significantly between the early 1950s and the mid-1970s.

Rural-urban distribution. Bangladesh remains a rural country, although the percentage of urban population, estimated at only 9 percent in 1974, has been increasing. The 1981 census places it at 14 percent. Since 1931, the rate of urbanization has been quite high, particularly after independence from the British in 1947. The annual compound growth rates of urban population were 3.7 percent and 7.1 percent for 1951–1961 and 1961–1974, both well above the corresponding population growth rates. The chief city, Dacca, had a population of 1.7 million in 1974, accounting for 24 percent of the total urban population and representing a 222 percent increase over 1961. The next city, Chittagong, had a population of just under 1 million in 1974. There were 108 places defined as urban in 1974 as compared with 61 in 1961. In 1961, four areas had a population over 100,000; this number had increased to six by 1974.

Social and Economic Characteristics. Although Bangladeshis can trace their origin back to various races and nationalities, they are today a homogenous people in terms of language, culture, and behavioral patterns. The population includes a little over half a million members of various tribes with different cultural backgrounds. Major tribes are the Santhal, Magh, Manipuri, Khasia, and Chakma. Bangladeshis are predominantly Muslims, who accounted for 85 percent of the total population in 1974. Hindus are next in importance with 14 percent. The residual 1 percent is composed of Buddhists, Christians, and others.

Economic status and social stratification. Because of problems of definition, official censuses and surveys produce very low estimates of unemployment in Bangladesh. The census estimated the proportion of unemployed persons at 2.4 percent of the total civilian labor force. Independent survey estimates indicate figures between 20 and

40 percent, which include underemployment, since it is difficult to separate the two concepts in the sociocultural environment of Bangladesh. Agriculture is the major occupation, although its share in the total declined from 86 percent in 1961 to 77 percent in 1974. Among nonagricultural activities the service sector is the most important, accounting for 18 percent of the total labor force in 1974. The manufacturing sector remained unchanged at 5 percent between 1961 and 1974.

The level of income is low for the majority of the population. A large proportion (over 70 percent in 1973–1974) fall below the minimum consumption or, poverty line. The society is highly stratified in terms of relative income and land holdings. In rural areas control of land is an important source of economic and political power. The society is also divided along kinship and factional lines, resulting in relationships that affect population characteristics.

Literacy and education. It is difficult to compare census figures on changes in the literacy rate because of definitional differences. The 1974 census defined literacy in terms of ability to both read and write in any language, resulting in an estimated literacy rate of 20 percent, an increase of 4 percent since 1961. The male rate was 27 percent and the female rate 12 percent in 1974. Between 1961 and 1974 female literacy increased on an average 0.34 percent per year, compared to 0.26 percent for male literacy. The literacy rate in urban areas was more than twice that in rural areas, although the rural-urban differential narrowed between the two periods.

In 1974, 63 percent of males and 87 percent of females of age 15 and above reported having had no formal school education. Only 13 percent of males and 7 percent of females completed primary education, with proportions falling rapidly as people moved up the education ladder. Similarly, educational attainment declined with age cohort. For each group, relatively more people received education in urban areas than in rural areas. The school dropout rate was very high. About 75 percent of children enrolled in grade 1 dropped out before completing four years of schooling. According to the 1974 census, of the total enrollment of 7.1 million students, 70 percent were at the primary level, 25 percent at the secondary level, 3 percent at the higher secondary level, and 0.7 percent at the college level and beyond, with the remaining not reported.

Policy and Action. Official concern with population growth in the Indian subcontinent dates back to early years of British administration, when in the true Malthusian tradition the occurrence of famines and the widespread prevalence of want and misery among the masses were attributed to an imbalance between the size of population and the sustaining power of the soil. Since 1880, this concern was expressed in the reports of various famine commissions.

The size and growth of the population received considerable attention in the final report of the 1943 Bengal Famine Commission (India, 1945). It took the view that although the rate of population growth in India had been less rapid than in certain other countries, in relation to the level of economic development, India was overpopulated. The Pakistan government first recognized the seriousness of the population problem in the early 1960s, when it discovered that over the First Five-year Plan period (1955–1960) the actual rate of population growth exceeded the level assumed in the plan. A National Family Planning Program was initiated in 1965.

The First Five-year Plan of independent Bangladesh (1973–1978) recognized the need for evolving a comprehensive population program. It proposed a number of moderate population targets. Later, the Bangladesh government accorded a higher priority to the population question and set up a National Population Council in 1976. The council revised earlier targets in favor of a more ambitious program, which called for the attainment of a net reproduction rate of 1 by 1985. In view of the limited progress made since 1976 in achieving targets of acceptors of various types of family planning services—for example, sterilization, intrauterine devices (IUD's), oral pills, condoms, and traditional methods—the target year for reducing family size to replacement level was shifted to 1990.

Bangladesh remains basically a society that does not practice contraception. The 1968–1969 National Impact Survey reported that 64 percent of married women in all areas (63 percent in rural and 83 percent in urban areas) had knowledge about family planning but only 3.7 percent were current users of a family planning method (3.6 percent in rural and 6.5 percent in urban areas) (Pakistan, 1974). These proportions have gone up over the years, as revealed by the Bangladesh Fertility Survey (1975). But it seems that among married women of reproductive age, the ceiling of the ratio of those who accept to those who do not accept was well under 20 percent. This figure was brought about by a saturation scheme of distributing contraceptives carried out in one area (Matlab thana in Comilla district). The proportion of married women expressing intention to adopt one or more methods of family planning increased from 15.5 percent in 1969 (National Impact Survey) to 19.8 percent in 1975 (Bangladesh Fertility Survey). It has been found that both level of education and number of living children had a positive influence on knowledge, attitudes, and practice of contraception. The most favorable attitudes toward population control were expressed by those with the greater exposure to the modern sector. A survey

conducted in 1975 found that 56 percent of the elite (university professors, researchers, senior government officials, owners of private businesses) approve of abortion as a method of family planning.

Government population policies are focused on creating a social awareness that favors small families. Major elements of strategy are integrated maternal and child health and family planning services, the development of a multisectoral approach (involving various ministries and agencies) towards delivery of services, and educational and motivational campaigns. Other important elements are the incorporation of population education into the school curriculum and the development of suitable programs for those out of school, the introduction of rewards and penalties both for those who accept family planning services and agencies that provide them, and the development of research and training. The only important legal measure is the minimum age for marriage, of 16 years for females and 18 years for males, a law existing for many decades but never seriously enforced. Future possible legal reforms include raising the legal age of marriage, enforcing that law, and liberalizing the law on abortion. Efforts by government and private agencies to deliver family planning services to women at high risk of pregnancy have had very limited success. It is thought that family planning will not reduce the fertility rate in Bangladesh in the near future.

Scholarly Activities. Recently a population association has been formed in Bangladesh. The association is yet to make any significant contribution to population related activities in the country except for holding an annual conference. Only peripheral attention is given to the teaching of population in universities. In recent years, however, a wide range of governmental and nongovernmental research institutions have come to focus attention on population problems. The Bangladesh Institute of Development Studies has a long history of useful research in demography. In recognition of its premier status, a Population Studies Centre was established under its aegis in 1974. The center is responsible for carrying out research on population, particularly on determinants of reproductive behavior in Bangladesh. The Population Control and Family Planning Division of the Ministry of Health and Family Planning carried out the National Fertility Survey in 1975, as part of the World Fertility Survey. Two journals, *Rural Demography* and *Bangladesh Development Studies,* publish materials related to population.

Mohiuddin Alamgir

See also ASIA; PAKISTAN; FAMILY PLANNING PROGRAMS, *article on* DEVELOPING COUNTRIES; INDIA.

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BIRTH CONTROL

See CONTRACEPTION; FAMILY PLANNING.

BIRTH CONTROL MOVEMENT

What was later to be known as the birth control movement began in England in the early 1800s. Various combinations of abortion, infanticide, coitus interruptus, postpartum abstinence, and numerous types of ineffective contraception had, of course, been practiced since ancient times in most societies, but only in the 1800s did there develop a social movement to promote smaller families for the well-being of the population and the individual. (For summaries of historical evidence of birth con-

trol, see Himes [1936], 1963; Fryer, 1966.) The term "birth control" was first popularized by Margaret Sanger in her magazine *The Woman Rebel,* published in New York City in 1914.

For nearly two centuries the birth control movement has reflected and blended people's varying concerns for social reform, for better health of women and their families, for reproductive choice for women, for improvement of sexual expression for both sexes through freedom from fear of pregnancy, for promotion of eugenics, and for a need to limit population growth. As a social movement it has met with opposition variously on the grounds that it is classist (aimed at reducing fertility of the poor), racist, immoral, or sexist, and on grounds of economic theories and philosophical beliefs; specific birth control methods have been attacked on medical, religious, or ethical grounds. The movement spread worldwide from western Europe and the United States and by now has touched nearly every country. This article will deal principally with the period 1800–1952. While it highlights the activities of many individuals and organizations, by no means are all mentioned who contributed to the movement.

Early 1800s. Early advocates of birth control in England included the Reverend Joseph Townsend, a Methodist, utilitarian, traveler, and author, who influenced the philosopher Jeremy Bentham; the freethinker and radical publisher Richard Carlile; and Francis Place, a social reformer and trade unionist credited with writing handbills on contraception that were first distributed to working-class people in 1823. Place believed that smaller families would lead to increased wages, reduced working hours, and time for recreation and pursuits in moral instruction. Knowledge that family size could be controlled, he believed, would encourage early marriage and thus discourage debauchery. Place directly challenged what he saw as Thomas Malthus's timidity to advocate contraception as a logical step in carrying out his economic theories. Malthus, a clergyman and professor, had recommended moral restraint in the form of "preventive checks" as a means of limiting population growth. The preventive checks he advocated were sexual abstinence and late marriage. Place's handbills circulated widely, advocating use of the vaginal sponge and practice of coitus interruptus. [*For discussion of Malthus's economic theories, see* POPULATION THEORY.]

English birth control advocates reportedly drew their knowledge of contraceptive methods principally from France, where coitus interruptus and the sponge appear to have been widely used from the 1700s onward by all strata of society. Townsend is said to have informed Bentham of the efficacy of the vaginal sponge.

Among Carlile's contributions to the birth control

movement was his 1825 article entitled "What Is Love?" In this he proposed that

1. No married couple need have more children than they wanted and could maintain;
2. No unhealthy woman need endanger her life;
3. There need be no illegitimate children, where they were not desired by the mother; and
4. Sexual intercourse might be made independent of the dread of conception. (as given in Fryer, 1966, p. 76)

His rationale for birth control has remained cogent for a hundred and fifty years.

America's first book on birth control was published in 1831 by Robert Dale Owen, social reformer, teacher, and son of the Welsh utopian Robert Owen. Entitled *Moral Physiology, or a Brief and Plain Treatise on the Population Question,* the book argued social and eugenic reasons for family limitation and informed the reader principally about coitus interruptus but also about the vaginal sponge and the condom. The book was published in both the United States and England. Owen, however, did not continue with the birth control movement, turning instead to politics and literary works.

Charles Knowlton, a Massachusetts physician, has been called America's second birth control pioneer. In 1832 he published *Fruits of Philosophy,* a treatise on contraceptive techniques that argued for birth control for social and medical reasons, as well as for limitation of population. Knowlton's booklet summarized his knowledge of physiology and promoted douching with various chemical solutions as a preferred contraceptive. Prosecuted several times (once on a charge of encouraging prostitution), Knowlton was fined and sentenced to three months' hard labor for publishing the work. His inexpensive booklet was widely distributed in numerous editions for more than forty years. Like Owen before him, Knowlton did not pursue the spread of birth control much after his initial efforts. Nevertheless, his booklet was germane to the coalescence of the birth control movement in England in the late 1800s when it became the focus of the Bradlaugh-Besant trial (discussed below).

Mid-1800s. During the mid-1800s interest in birth control grew slowly but steadily in both Great Britain and the United States. Norman E. Himes, whose comprehensive work on the medical history of contraception ([1936] 1963) is a classic in its field, documents the work of numerous medical and social writers on the topic during this period.

Among the influential midcentury writers was the Scottish physician George Drysdale, who published *The Elements of Social Science: The Physical, Sexual and Natural Religion* in 1854. Numerous other publications about con-

traception also appeared during this period, finding both eager readership and strong condemnation on grounds of immorality. Charles Bradlaugh, a reformist publisher and freethinker, proposed the first Malthusian League in 1861 in his journal *The National Reformer*. (Birth control was called Malthusianism from 1860, and New Malthusianism and Neo-Malthusianism from the late 1870s. The term "Malthusianism" had come to be considered inappropriate because Malthus had never recommended contraception. Dr. Samuel van Houten, a Dutch vice president of the Malthusian League, proposed the term "Neo-Malthusian," which was adopted by the league. The prefixes "new" and "neo" were intended to imply a differentiation in philosophy but adherence to the fundamental theses of Malthus, although all three terms were used interchangeably for decades.)

British intellectuals continued to concern themselves with population pressures despite the expanding colonial empire that served both to help feed Britain and to absorb a considerable part of its population. Among them was John Stuart Mill, who in his youth had assisted Francis Place to distribute his handbills. Although Mill never referred to contraceptive methods directly in his writings, several of his works promoted fertility control for social and economic reasons and in support of the emancipation of women. In his essay *On Liberty*, published in 1859, Mill proposed a philosophical foundation for government action in population matters:

And in a country, either overpeopled or threatened with being so, to produce children, beyond a very small number, with the effect of reducing the reward of labor by their competition is a serious offense against all who live by the remuneration of their labor. The laws which, in many countries on the Continent, forbid marriage unless the parties can show that they have the means of supporting a family do not exceed the legitimate powers of the State; and whether such laws be expedient or not . . . . they are not objectionable as violations of liberty. (Mill, 1956, p. 132)

Although the dominant lasting social movements for birth control were based in England and the United States, physicians, scientists, and political economists in many European states were concerned with the subject. A German, Frederick Adolphe Wilde, first advocated a cervical cap as early as 1838, and his countryman Dr. Mensinga (pseudonym of Karl A. Hasse) later in the century invented the Mensinga pessary, or diaphragm. Numerous German writers advocated birth control on grounds similar to those of English and American writers. The works of Polish, Russian, Italian, and Danish advocates have also been documented (Himes, 1963, pp. 318–323; Fryer, 1966).

Late 1800s. A turning point in open public discussion of birth control occurred in England when prosecution of publishers of birth control booklets caused lively debate in the press. Charles Knowlton's booklet *Fruits of Philosophy* had been published in England for four decades by the freethinker James Watson. However, in 1877, Charles Watts, who published a newly reprinted version of the booklet, was arrested for its sale on the grounds of promoting obscenity. In outrage over the suppression of free speech, and in support of the subject of birth control, Charles Bradlaugh and Annie Besant, who led the Free Thought movement, printed their own version of Knowlton's booklet and challenged the authorities to suppress its publication.

The resulting, highly publicized case brought against Bradlaugh and Besant under the Obscene Publications Act of 1857 was argued over the period 1877–1878. It ended with victory for the defendants, assuring the right to publish information on contraception for a general audience, as opposed to a strictly medical one. This right was granted in England decades earlier than in the United States, where the Comstock laws, enacted in 1873, prevailed until 1936 (they were not actually repealed until 1971). In 1877, Besant published *The Law of Population*, which updated the information in Knowlton's work and argued the tendency of population pressure to cause social problems. About 175,000 copies were distributed before Besant withdrew it from publication. (For reproductions of Knowlton's and Besant's texts, see Chandrasekhar, 1981.)

In light of the trial publicity, the Malthusian League was revived in England in 1877, with Dr. Charles R. Drysdale, George Drysdale's brother, as its president. Other leading members were Mrs. Besant, Dr. Alice Vickery (C. R. Drysdale's wife), Edward Truelove, George Standring, George Anderson, and John Bruson, most of whom also belonged to the National Secularist Society. Throughout its life the Malthusian League remained relatively small, with a membership of approximately 1,000, but it crusaded vigorously for birth control as a measure against poverty. League members espoused Malthus's economic theories, which were founded partly on the concept that poor people were to blame for their own plight. The Medical Branch of the Malthusian League had its first meeting in 1881 in London.

About the time of the Bradlaugh-Besant case in England, a similar case was brought against Edward Bliss Foote in the United States. Foote, who is thought to have coined the term "contraception," was tried and convicted in 1876 under the federal Comstock laws. His crime was the mailing, in response to a decoy letter, of his pamphlet on contraception entitled *Words in Pearl*. The Comstock law, among other provisions, forbade distribution through the mails of obscene materials. However, it was vague as to what constituted such material. Although

Foote's trial was not so famous as the Bradlaugh-Besant case, his other publications were thereafter widely printed and read, and his public helped him pay his considerable fine.

After the Bradlaugh-Besant trial, the Malthusian League began to develop international connections. A major interest of the league was to initiate birth control programs in countries considered overpopulated—India, China, and Japan. By 1880 the league had an Indian vice president and by 1882 a Hindu Malthusian League was begun. Funds were inadequate to support activities abroad, however, and the role of the league was thus limited to publications and occasional international meetings (Ledbetter, 1976; Chandrasekhar, 1981).

The Dutch Neo-Malthusian League, organized in 1882, was recognized by the Dutch government in 1895—a legal but nonendorsing step that nevertheless stimulated local opposition to the league. Although its major early activities were in publicizing contraception and the economic message of Malthus, after 1892 the Dutch league began to hire midwives to educate working women about contraception. The Dutch physician and league member Aletta Jacobs opened the first free clinic and used for the first time on a wide scale the "Mensinga pessary," or diaphragm.

In France the Ligue pour la Régénération Humaine was established in 1896 by Dr. Paul Robin, who had for some time advocated birth control and had been in touch with the English league. However, the cause of neo-Malthusianism was ill suited to a country fearing "depopulation" in the face of military and economic challenge for leadership on the continent; numerous groups supporting population increase developed. Moreover, the economic theories of Malthus did not appear to explain the existence of poverty in France, the country that had pioneered early reduction in fertility and widespread use of contraception. (For an excellent exposition of the prevailing theories of depopulation, see Spengler, 1979; Nitti [1894], 1976).

In Germany no national leagues were formed, but strong local ones grew in a few cities. Although the English Malthusian League assisted the formation of leagues elsewhere on the continent, these proved to be fairly weak. (For further information on the Swedish, Italian, Swiss, Spanish, and German leagues, see Ledbetter, 1976.) All the continental Malthusian leagues of the period met with church or governmental opposition of varying strength.

Early 1900s. Activities of the national Malthusian leagues grew. The Fédération Universelle pour la Régénération Humaine, proposed by Dr. Robin in 1898, began to hold international meetings. Representatives of Neo-Malthusian leagues from England, Holland, France, Belgium, Switzerland, Spain, Germany, and Hungary attended an international conference at the Hague in 1910. By 1914, Brazil, Cuba, Italy, and Algeria were also represented (Ledbetter, 1976, pp. 189–190). The journal of the British Malthusian League, begun in 1879, continued publication. Several other leagues also published national journals.

The United States and England, early development of services. The major force after World War I was not the Malthusian leagues, however, but the American nurse Margaret Sanger. In the ten years between her marriage to William Sanger in 1902 and the coining of the term "birth control," in 1912, she had been a radical socialist, an organizer of the Woman's Committee of the Socialist Party, and a strong supporter of radical feminism, following the views of her anarchist friend Emma Goldman. While working as a visiting nurse among immigrant families in tenements in the lower east side of Manhattan, Sanger was struck by their poverty and ignorance and the burden of unwanted pregnancies. She wrote a series of articles about feminine hygiene entitled "What Every Girl Should Know," but the series was banned from the mails in late 1912. In 1914 she began to publish a magazine, *The Woman Rebel*, and was soon charged with violating the Comstock laws. Because the indictment was directed toward articles unrelated to birth control, and was not based on the provisions of the Comstock laws that she had planned to challenge, Sanger sought refuge in England rather than contest the indictment. She simultaneously published a pamphlet entitled *Family Limitation* that would directly challenge the law banning dissemination of information on contraception. Sanger's husband was arrested and jailed for distributing the pamphlet, but the case outstanding against Margaret Sanger was dropped after her return to the United States in 1915.

In England in 1914 Sanger met and was influenced by the leaders of the Neo-Malthusian League, including Dr. and Mrs. Charles Vickery Drysdale (C. V. Drysdale had taken over leadership of the league from his father, C. R. Drysdale, and his mother, Alice Vickery), and by Havelock Ellis, a sexual psychologist interested in eugenics. She studied population theories and birth control techniques in England, and in Holland with Aletta Jacobs and Dr. Johann Rutgers before returning to the United States. From that time she continued to seek a strong scientific basis for her work. She embarked on a lecture tour of the United States to dramatize her opposition to the Comstock laws and to promote her cause.

Sanger opened the first birth control clinic in the United States in 1916. In 1917 she and her sister and co-worker, Ethel Byrne, were tried and convicted for selling contraceptive devices, which at that time was a criminal offense. With the help of a growing number of sup-

porters she began the *Birth Control Review,* which was published briefly in 1917 and again from 1920 to 1928.

Sanger saw herself as an agitator and propagandist and not as an organizer of large groups. However, she founded several organizations devoted to promoting birth control: the Birth Control League of America (1914) and the American Birth Control League (1921), which included as its clinical arm the New York Birth Control Clinical Research Bureau (1923) of which she became director. (In 1965 the research bureau became the Margaret Sanger Center of Planned Parenthood of New York City.) The National Birth Control League, organized during Sanger's 1914–1915 stay in Europe and led by Mary Ware Bennett, Clara Stillman, and Anita Block, provided early financial and social support for the cause.

During the 1920s and 1930s, birth control activities began to spread throughout the United States. Key groups and individuals became involved in the movement. Among these was the Committee on Maternal Health. It was headed by Robert Latou Dickinson, a prominent obstetrician-gynecologist who became a leading proponent of contraceptive research. Among other activities the committee commissioned the important studies done by Caroline Hadley Robinson (1930) on existing birth control clinics and by Norman E. Himes on the history of contraception ([1936] 1963). Clarence Gamble, another American pioneer of the movement, was a member of the committee from 1929; nearly thirty years later he went on to establish the Pathfinder Fund. In the intervening years he assisted and supported financially the development of birth control service throughout the United States. His leadership was particularly significant in the development of birth control services in the South. With assistance from Gamble, nurses began to provide birth control services in Kentucky, Tennessee, West Virginia, and eventually in North Carolina, which in 1937 became the first American state to offer birth control through its public health services.

By 1930, Robinson was able to document a surprisingly large number of birth control clinics concentrated primarily in the United States and England but scattered as well throughout the world. She collected data on 70 birth control centers in Europe and in the United States, and had heard of some 250 others. By 1930 some 70,000 clients had been served in the 70 clinics for which she was able to collect data. The clinics were located mainly in Germany, Austria, England, and the United States; one was identified in Russia. About half provided birth control services exclusively, although some were located in facilities of other organizations, such as settlement houses. The other half were organized primarily for other purposes, such as marital or sexual assistance, public welfare, or general health services, and provided birth control advice and service in addition. That most of the Eng-

lish and American clinics, and nearly one-third of the German were staffed by women doctors is surprising considering the small number of women practicing as physicians at the time (Robinson, 1930).

There are significant parallels in the development of birth control in the United States in Great Britain. Dr. Marie Stopes, a paleobotanist who had become a crusader for improving marital sexual relationships, may be considered the British counterpart of Margaret Sanger. The two met during Sanger's 1914 trip to England. Stopes advocated birth control as a means to improving woman's control over her own body, as an aid to the fulfillment of marriage, and as a means to prevent excessive, unwanted, childbearing. She urged birth control for eugenic reasons as well, and was long a member of the Eugenics Society. Like Sanger, Stopes won fame first through publication of pamphlets. The controversial *Married Love: A New Contribution to the Solution of Sex Difficulties* and *Wise Parenthood,* published in 1918, were widely read. In 1921 she and her husband, Humphrey Verdon Roe, opened the Mother's Clinic for Constructive Birth Control in the Holloway district in London. In the same year she founded the Society for Constructive Birth Control and Racial Progress, and in 1922 she began to publish *Birth Control News.* Thus in 1922 two English publications bore the new term "birth control" in their titles, for in that year also the Malthusian League changed the name for its publication from *The Malthusian* to *The New Generation: For Rational Birth Control.*

Stopes had by 1921 broken with the Neo-Malthusian movement, over a strong difference of opinion about which contraceptive method was best suited to female anatomy. She preferred the "high-domed pessary," or cervical cap, to the Mensinga pessary, or diaphragm, which she thought would stretch the vagina and reduce sexual pleasure. The Malthusian League, which opened a clinic in 1921, preferred the diaphragm, which had gained good repute from Jacobs's clinic in Holland. Sanger's clinic, headed first by Dr. Dorothy Bocker and after 1925 by Dr. Hannah Stone, also used the diaphragm. This conflict over method persisted as Sanger and Stopes introduced the movement to other countries.

In the mid-1930s, Stopes was a member of the Birth Rates Commission and played a key role in encouraging the British Ministry of Health to provide birth control information and services through existing maternity and child welfare centers. The Family Planning Association of Great Britain had meanwhile been founded in 1930 and stimulated provision of services throughout England, Scotland, and Wales in close cooperation with the local health authorities.

The name of the American Birth Control League was changed to Planned Parenthood Federation of America in 1942 when it merged with the Clinical Research Bu-

reau. The association grew into a strong national organization supported by volunteers and with volunteer and professional staffs.

Promoting services worldwide. The changing economic and social conditions of World War I Europe and the postwar economic boom and later depression were the setting for dramatic developments in the birth control movement. Forces in support of birth control included the admission of women to war-related factory jobs, the suffragette movement for women's rights, a perceived need to limit family size for economic reasons, and among some intellectuals, continuing belief in the Malthusian argument that growth of population, especially among the poor, must be brought into balance with economic resources and available jobs. C. V. Drysdale, Havelock Ellis, and Marie Stopes in England, Margaret Sanger, Clarence Gamble, and Frederick Osborn in the United States, and many other leaders of the movement were also attracted to eugenics theories that rose in part from Social Darwinism. Persuaded by the idea of survival of the fittest, they argued for selective birth control to reduce the numbers of the unfit in society. Although in her later years Sanger moved away from this rationale, many were motivated to support the movement financially or otherwise from a concern for eugenics. In this vein, sterilization of poor women and of those considered mentally, morally, or physically unfit was carried out in many countries: in Nazi Germany in the 1930s and early 1940s extreme repressive measures were taken in the name of racial improvement.

By contrast, burgeoning opinion also developed that national strength lay in numbers. The birth control movement was challenged by those who noted the low fertility rates of such countries as Sweden, the United States, and France; they considered the major population problem, at least in the developed countries and among the middle and upper classes, to be one of a long-term decline in fertility. (For contemporary discussions of low fertility, see Spengler, 1979; Myrdal, 1940; Lorimer et al., 1940.) In Germany and Japan women were urged to bear children for the sake of the state. Other opposition to the birth control movement came from religious leaders, particularly those of the Roman Catholic Church.

It was in this context of contrasting values and positions that Sanger had emerged as the major leader of the international birth control movement. Sanger was early to perceive population growth in some parts of the world as a threat to world peace. She organized the American Birth Control Conference in 1921, the Sixth International Birth Control and Neo-Malthusian Conference (New York, 1925), the World Population Conference (Geneva, 1927), and the Seventh International Birth Control Conference (Zurich, 1930). Emerging from these meetings were the International Union for the Scientific Study of Population and the International Medical Group for the Investigation of Contraception. Sanger was also among the thirty-eight people who met in May 1931 to organize the Population Association of America.

Sanger and Stopes, like the Drysdales before them, began to travel widely to promote birth control. Stopes's influence derived from support given by the Society for Constructive Birth Control to clinics in Scotland, Northern Ireland, South Africa, Australia, and New Zealand, from the fame of her original clinic, and from her books, which were widely translated and distributed.

Sanger visited Hawaii and the Far East in 1922 and traveled to Russia in 1934. From 1930 to 1936 she was president of the Birth Control International Information Centre in London, and under its auspices she toured and lectured in India for three months in 1936–1937, attending the All-India Women's Conference. Sanger also influenced Baroness Ishomoto (later known as Mrs. Schidsue Kato) to open a birth control clinic in Tokyo in 1936. Kato's activities were subsequently prohibited by the government as being against the interests of the state.

Mid-1900s. Economic, demographic, and social conditions after World War II stimulated renewed growth of the international movement, which had been curtailed during the war. In Japan, growth of abortion as a means of birth control stimulated prewar activists like Mrs. Kato to fight for birth control services. (Sanger and Gamble, who had been invited by the Japanese to assist in this development were for a time turned away by the American occupation government.) The major leader who emerged in India was Lady Dhanvanthi Rama Rau, who established the Family Planning Association of India in 1949 and organized the All-Indian Family Planning Conference in 1952.

Meanwhile, steps had been taken to make plans for an international association of the existing European and American associations. After an organizational meeting at Cheltenham in 1948, the International Planned Parenthood Federation was founded. It met in Bombay, India, in 1952, with Rama Rau and Sanger as co-presidents.

Activism and a theoretical base for birth control had existed from the beginning of the movement. New rationales were added throughout the nineteenth and early twentieth centuries. Sanger, as well as other leaders, from the time of the Malthusian League had perceived the need to bring demographers, social scientists, and the medical community together with the activists, to lend support to the movement and to draw from their expertise. This kind of thinking led as well to the establishment in 1952 of the Population Council by the philanthropist John D. Rockefeller III. The council went on in its early years to conduct research into population phenomena and to investigate the scope of the newly perceived prob-

lem of population increase. Its first chairman was Rockefeller, and its first executive vice president was Frederick Osborn, who later served as president. New, monied, male activists joined those twentieth-century women who had led the birth control movement, and major philanthropic resources became available to promote both control information and clinic services.

Shortly after its establishment, the United Nations began to pay attention to demographic issues, and the international ranks of those concerned with population as a problem swelled.

Although the birth control movement has continued, 1952 marked a major turning point in its development. Many countries began to consider offering family planning services and to study population phenomena with a view to reducing population growth rates. Old rationales for better health for women, sexual expression, and improved family economics remained important, but it was dramatic population growth that brought new actors and new organizations into the movement.

Jeanne Betsock Stillman

See POPULATION THEORY *for discussion of the theoretical framework for population thought in the eighteenth, nineteenth, and twentieth centuries. See also* CONTRACEPTIVE USE; FAMILY PLANNING PROGRAMS, *articles on* DEVELOPING COUNTRIES *and* UNITED STATES; LAW AND FERTILITY REGULATION. *Related articles are* INTERNATIONAL PLANNED PARENTHOOD FEDERATION; INTERNATIONAL UNION FOR THE SCIENTIFIC STUDY OF POPULATION; POPULATION ASSOCIATION OF AMERICA; UNITED NATIONS.

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BIRTH RATES

See RATES AND RATIOS.

BRAZIL

Colonized by Portugal, Brazil has a culture and a language distinct from those of its Spanish-speaking neighbors, and a history that identifies it as unique among the countries in the New World. Covering 8.5 million square kilometers (3.3 million square miles), Brazil is the fifth largest country in the world, surpassed only by the Soviet Union, the United States, the People's Republic of China, and Canada. With an estimated population of 119 million in 1980 and an estimated growth rate of 2.5 percent during the 1970s, Brazil is the sixth most populous nation and one of the fastest-growing countries among those with more than 100 million people.

Population Characteristics. In the absence of a reliable registration system for vital statistics, the principal sources of information about the size of the Brazilian population are the censuses, conducted in 1872, 1890, 1900, 1920, and every ten years since 1940. These counts have yielded results of varying quality. The census of 1960 was of doubtful accuracy and was not fully tabulated until 1978, so that many analyses of past population trends have relied, for the most part, on the censuses of 1940 and 1950, which are considered among the most accurate in Latin America. The 1970 census, because of its high quality and the availability of special tabulations of the data, has stimulated a growing professional interest in the hitherto limited field of population study in Brazil.

Early estimates of the size of the population are subject to the well-known caveats associated with the use of indirect measures of demographic variables. With due caution, one may conclude that at the end of the eighteenth century the population of Brazil was about 3 million. In the 1870s, at about the time of the first census, the population is estimated to have been just under 10 million, with a crude rate of natural increase of 1.8 percent per year by 1900. The combination of excess births over deaths and substantial immigration from Europe, associated with the expansion of coffee production in southern Brazil, led to a population of 18 million at the start of the twentieth century. By 1950 it had reached 52 million, and, growing at a rate of approximately 2.9 percent annually thereafter, it increased to 93 million in 1970.

By 1970, however, there was increasing evidence that the growth rate was falling, mainly as a result of continued fertility declines in the more developed areas of the country. During the 1970s, the results of periodic national household surveys led many demographers to conclude that the fertility decline had spread to other parts of Brazil, and that the 1980 census would probably reveal an average 1970–1980 annual growth rate of 2.6 percent.

The national census of 1950 estimated 10.8 million women of reproductive age (15–49). By 1970 the number of women in this age group had more than doubled, increasing to 22.1 million in the short span of twenty years. In 1950 women of reproductive age constituted 49.2 percent of the female population—only slightly more than their proportion in 1970 (47.3 percent). The distribution of women among the intermediate age groups (15–19, 20–24, . . . 45–49) has remained very nearly constant.

In 1970, 54.5 percent of the female population aged 15 and over were married and 33.5 percent were single; smaller proportions were widowed (8.7 percent), separated (3.0 percent), and with formalized legal separation (0.3 percent). Among married women, 64.5 percent were united in both civil and religious ceremonies, and 7 percent were living in consensual unions.

Components of population increase. Population growth in Brazil has exceeded 2 percent per year since the late nineteenth century. However, while the rate of increase has remained high, the factors that contributed to population growth have changed over time. As can be seen in Table 1, international migration contributed significantly to the size of the population in the late nineteenth and early twentieth centuries. Because slave labor was no longer available after 1888, agricultural workers were systematically recruited from other countries, with the state and federal governments often subsidizing transpor-

TABLE 1. *Components of population change: Brazil, 1854–1970 (average annual rates per 1,000 population)*

Years	Total increase[1]	Net migration	Natural increase	Crude birth	Crude death
1840–70	15.1	+0.9	14.2	46.5	32.3
1871–90	19.1	+2.0	17.1	46.6	29.5
1891–1900	24.2	+6.0	18.2	46.0	27.8
1901–20	20.8	+2.2	18.6	45.0	26.4
1921–40	20.5	+1.8	18.7	43.5	24.8
1941–50	23.9	+0.4	23.5	44.4	20.9
1951–60	30.0	+0.9	29.1	43.3	14.2
1961–70	27.9	+0.0	27.9	40.0	12.0

[1]Total increase = net migration + natural increase.
SOURCE: Moreira, da Silva, and McLaughlin, 1978; reprinted by permission.

tation costs to Brazil. From 1887 to 1957, 4.8 million people emigrated to Brazil. Italy and Portugal contributed the largest proportions of immigrants (31.7 and 30.6 percent respectively), followed by Spain (13.8 percent) and Japan (4.4 percent.)

During the twentieth century, the importance of international migration has diminished. In 1934 the federal government established a quota system to control the number of immigrants from any one nation (no more than 2 percent of the immigration from that country during 1884–1934) and to limit the total immigration during any single year to 77,000. By the 1960s, immigration was making a negligible contribution to Brazil's population growth.

The household sample surveys conducted by Brazil's census bureau during the decade indicate a rapid fertility decline during the 1970s. In 1980 Brazilian census data show an enumerated population which is 4 million smaller than that projected in the beginning of the decade by the Fundação Instituto Brasileiro de Geografia e Estatística (IBGE); this fact confirms previous analyses by Brazilian demographers showing a rapid decline of national fertility begun probably at the end of the 1960s. There is still debate by Brazilian and foreign demographers about the extent of fertility decline. Pending further analysis of the 1980 census, estimates of the 1980 crude birth rate range from 30 to 34, a difference large enough to have important consequences for the long-term growth of the Brazilian population.

Regional trends in population growth. No discussion of population growth patterns in Brazil would be complete without an analysis of regional trends in fertility and mortality, because the well-known geographic disparities in socioeconomic development are reflected in pronounced differences in vital rates. These, in turn, influence regional patterns of demographic growth and affect the direction and intensity of internal migration flows.

To break down overall population trends into regional components, Brazil's twenty-two states and four territories have been divided into ten relatively homogeneous groups. For each of these ten regions, Table 2 presents estimates of the total fertility rate and life expectancy at birth.

The total fertility rate in Brazil declined nearly 8 percent from 1930–1940 to 1961–1970. This is attributed to the drop in fertility levels in the more developed regions of Brazil, particularly São Paulo and the south, and, to a lesser extent, to declines in Minas and Rio de Janeiro. This downward trend stands in contrast to the marked increase in fertility recorded in the less developed regions, including Amazonia, the northern region, Bahia, and Paraná. Moreover, the substantial north-south fertility differential observed in 1930–1940 increased during the next three decades.

As in the case of fertility levels, there were wide regional differences in life expectancy (see Table 2). In fact, the average life expectancy at birth of 44.2 years in the northeastern region in 1960–1970 was only slightly higher than recent estimates for Africa, and it represents a mortality level comparable to that which existed in European countries in the 1870s, in contrast to a high of nearly 62 years found in the southern region.
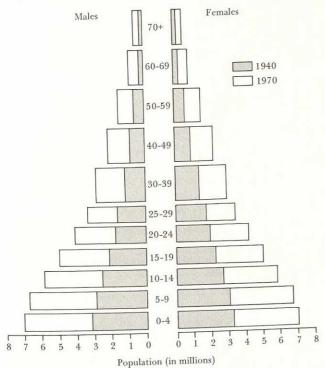
TABLE 2. *Regional differences in total fertility rates and average life expectancy at birth: Brazil, 1930–40 to 1960–70*

Macroregions and regions	Total fertility rate				Life expectancy at birth			
	1930–40	1940–50	1960–70	Percent change 1930–40/ 1960–70	1930–40	1940–50	1960–70	Percent change 1930–40/ 1960–70
North								
Amazonia	6.9	7.3	8.1	+17.4	39.8	42.7	54.2	+36.2
Northeast								
Northern	7.0	7.0	7.3	+ 4.3	40.0	43.7	50.4	+26.0
Northeastern	7.9	7.7	7.8	− 1.3	34.7	34.0	44.2	+27.4
Bahia	6.9	7.3	7.6	+10.1	38.3	39.2	49.7	+29.8
East								
Minas	7.2	6.8	6.5	− 9.7	43.0	46.1	55.4	+28.8
Rio	4.2	4.0	4.0	− 4.8	44.5	48.7	57.0	+28.1
South								
São Paulo	5.6	5.1	4.2	−25.0	42.7	49.4	58.2	+36.3
Paraná	5.9	5.9	6.5	+10.2	43.9	45.9	56.6	+28.9
Southern	6.2	6.2	5.1	−17.7	51.0	55.3	61.9	+21.4
Central-West	6.2	6.4	6.6	+ 6.5	46.9	49.8	57.5	+22.6
All regions	6.5	6.3	6.0	− 7.7	41.2	43.6	53.4	+29.6

SOURCE: Moreira, da Silva, and McLaughlin, 1978; reprinted by permission.

Over the last four decades the average life expectancy at birth increased by nearly 30 percent in Brazil. The highest percentage increases were recorded in São Paulo and Bahia, whereas those regions with already high levels in the 1930s (south, central west) experienced relatively smaller improvements. These trends imply a gradual reduction in interregional differences in mortality levels between 1940–1950 and 1960–1970.

Age structure. Figure 1 shows the age distribution of the Brazilian population in 1940 and in 1970. The shape of the age-sex pyramid, with a wide base (representing the younger age groups) and growing proportionately narrower at the top (representing the older age groups), is typical of a developing country that has experienced declining mortality and high fertility rates. While the size of the Brazilian population increased from 41 million in 1940 to 93 million in 1970, fertility rates declined slightly so that the age structure remained nearly the same. In 1940, 42.5 percent of the population was under age 15 and 55.9 percent was aged 15–69. Three decades later, persons under age 15 made up 42.0 percent of the population, with 56.0 percent aged 15–69. The child dependency ratio in Brazil (defined as the proportion of the population under age 15 divided by the proportion aged

15–69, multiplied by 100) was 76 in 1940, declining slightly to 75 in 1970.

Future trends. The concentration of Brazil's population in the younger age groups implies that, even with the decline in fertility rates currently under way, the population will continue to increase well into the next century because of the large cohorts that will reach reproductive age. The extent of the increase will depend on the interaction of fertility and mortality in the years ahead, since it is assumed that net international migration will be unimportant. A "low" population projection prepared by the IBGE assumes a decline in the total fertility rate of 31 percent between 1970 and 2000; and a "high" projection is based on a more conservative assumption of a 15 percent decline. Either way, the population of Brazil would double in the thirty-year period, surpassing the 200 million mark by the year 2000.

Population Distribution. Among the statistics cited most often regarding Brazil is the low population density, estimated to be about 14 persons per square kilometer (5 per square mile) in 1980. This figure, however, masks significant interregional differences. Vast expanses of the Brazilian interior are nearly uninhabited. The northernmost region, which comprises 42.1 percent of the national territory, has a density of only 1 to 2 persons per square kilometer. Similarly, the states of Goiás, Mato Grosso do Sul, and the Federal District, which make up the central west region and comprise 22 percent of the total area of Brazil, have a population density of only 4.0. This is in marked contrast to the coastal states, particularly those of the south. The highest population density, 265 persons per square kilometer (686 per square mile), is found in the state of Rio de Janeiro. However, this is a special case since almost 50 percent of its population lives in the city of Rio de Janeiro.

The fact that most of Brazil's inhabitants are concentrated within a few hundred kilometers of the Atlantic coastline has preoccupied Brazilian policymakers since colonial times. In 1960 the Brazilian capital was moved from Rio de Janeiro to the interior state of Goiás in an attempt to shift the population further inland. Similarly, the government has continued its highway-building program, which in the early 1970s included an immense road system in Amazonia to draw population from the overcrowded northeast.

Urban-rural distribution. Census figures indicate a rapid increase in the proportion of Brazilians residing in urban places. In 1940, the urban population represented 31.2 percent of the total, increasing to 45.1 in 1960 and 56.1 in 1970. The urban population was estimated at 60 percent for 1975 and 68 percent by 1980. São Paulo, the world's third largest metropolitan area in 1980 with approximately 12.6 million people, was expected to be the

FIGURE 1. *Population by sex and age group, Brazil, 1940 and 1970*

Source of data: Statistical Yearbook of Brazil, 1975.
SOURCE: Moreira, da Silva, and McLaughlin, 1978; reprinted by permission.

the societal level, especially where the practice of birth control is not widespread. Recent estimates suggest that the total woman-years of protection against pregnancy provided by breastfeeding in the Third World is quite substantial and may well be larger than the total amount of contraceptive protection achieved through family planning programs, at least up to 1974. The impact on fertility rates of reduced use of breastfeeding would depend on the length of amenorrhea associated with breastfeeding prior to the change as well as on the prevalence of birth control.

Under reasonable assumptions about the average number of months required between live births exclusive of amenorrhea, the substitution of bottle-feeding for breastfeeding in the absence of any practice of birth control would reduce the average birth interval by 14 percent in a population where breastfeeding is associated with an average of about five months of amenorrhea. In contrast, in a population where amenorrhea among nursing mothers is close to eighteen months, the average birth interval would be reduced by 40 percent. Reductions in the average birth interval by these amounts are equivalent to raising fertility by 16 and 64 percent, respectively (Knodel, 1977).
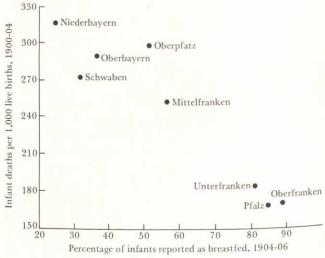
Infant Survival. The advantages of breastfeeding over artificial feeding for promoting infant survival are now well known. Breast milk is nutritionally ideal, at least for the first six months; it provides some immunity from disease and it is clean (Buchanan, 1975). The impact of breastfeeding on infant mortality risks therefore depends on the nutritional quality of substitute foods, the sanitary conditions surrounding artificial feeding, and the overall health conditions of the infant's environment. When these circumstances are unfavorable, mortality differences between breastfed and artificially fed infants will be substantial. As circumstances improve, the mortality difference diminishes and becomes relatively insignificant, as is the situation in much of the developed world today. There are, of course, a number of other benefits of breastfeeding not directly related to chances of survival, which may or may not persist, but such benefits are not pertinent to an assessment of the demographic consequences (Harfouche, 1970).

The superiority of breastfeeding has long been recognized in developed countries. In those areas of central Europe where long-standing traditions discouraged women from breastfeeding their infants in the past, public officials and medical doctors regarded the prevailing infant-feeding practices as the major cause of the high infant mortality rate. This concern spurred a large-scale survey of infant-feeding practices in Bavaria between 1904 and 1906, which provides striking evidence of the relation between breastfeeding and infant mortality. The survey documented the sharp regional differences in breastfeeding practices within Bavaria. In Figure 1 the infant mortality rates in 1900–1904 in the eight provinces of Bavaria are plotted with the percentage of breastfed infants reported in the survey. A clear negative association between breastfeeding and infant mortality is apparent. A regression analysis of these same data based on the 108 Bavarian districts for which information was available yields results of high statistical significance. A 10 percent reduction in the percentage of mothers who breastfed is associated with an increase of 21 infant deaths per 1,000 births. According to the regression equation, with 100 percent breastfeeding the infant mortality rate would have been 148, and in the total absence of breastfeeding 355.

A number of studies in Europe and the United States since the end of the nineteenth century afford direct comparisons of the mortality risks of breastfed infants and artificially fed infants. Results of some of these studies are summarized in Table 2. The data are not strictly comparable in all respects, and the way the mortality rates were calculated is not always clear. In most cases the omission of records for the first few days or weeks of life causes an understatement of mortality for both categories of feeding. Nevertheless, the results consistently show that the chances of surviving to age 1 year were substantially higher for breastfed infants than for artificially fed infants. The extent of the difference, however, varies considerably from study to study. In Berlin and Barmen around the turn of the century over 30 percent more in-

FIGURE 1. *Infant mortality rates, 1900–1904, and breastfeeding practice, 1904–1906, in the eight provinces of Bavaria*

SOURCE: Knodel, 1977; reprinted by permission.

TABLE 2. *Infant mortality rates and survivorship rates to age 1 by type of infant feeding*[1]

Study area	Dates	Infant mortality (per 1,000)		Survivors to age 1 (per 1,000)		
		Breast-fed	Artif. fed	Breast-fed	Artif. fed	Differ-ence
Berlin	1895–96	57	376	943	624	319
Barmen, Germany	1905	68	379	932	621	311
Hanover, Germany	1912	96	296	904	704	200
Boston	1911	30	212	970	788	182
Eight U.S. Cities[2]	1911–16	76	255	924	745	179
Paris	1900	140	310	860	690	170
Cologne	1908–09	73	241	927	759	168
Amsterdam	1904	144	304	856	696	160
Liverpool	1905	84	228	916	772	144
Eight U.S. Cities[3]	1911–16	76	215	924	785	139
Derby, England	1900–03	70	198	930	802	128
Chicago	1924–29	2	84	998	916	82
Liverpool	1936–42	10	57	990	943	47
Great Britain	1946–47	9	18	991	982	9

[1]The rates included in this table are not strictly comparable. Most refer to mortality after several days, several weeks, or the first month and thus underestimate the actual infant mortality rates and overestimate the actual survival rates. Only rates for the eight U.S. cities in 1911–1916 refer to mortality since birth, with deaths occurring prior to any feeding being proportionately allocated to the two feeding categories. The rates for Berlin, Barmen, Hanover, Cologne, and the eight U.S. cities were derived by applying life table techniques to mortality rates given by single months of age.
[2]Comparison of breastfed infants with infants artificially fed since birth.
[3]Comparison of breastfed infants with all artificially fed infants.
SOURCE: Knodel, 1977; reprinted by permission.

fants survived to age 1 among the breastfed than among the artificially fed, but the advantages of breastfeeding are shown to be clearly diminished in the more recent studies. The few studies that give separate results for infants receiving mixed feeding indicate that the mortality risks for such infants were intermediate between those of wholly breastfed and wholly bottlefed babies.
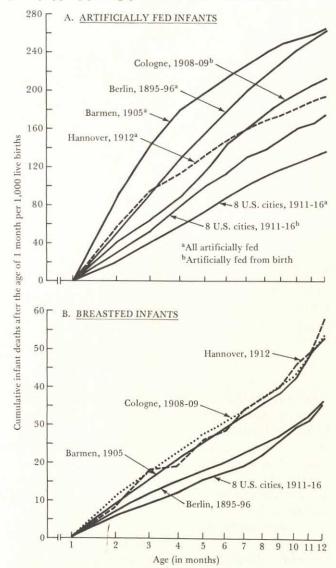
There is considerable evidence that, in the past at least, not only did the level of mortality differ between breastfed and artificially fed children but so did the age patterns of mortality within the first year of life. Examination of historical data for populations that differed considerably in their breastfeeding customs revealed similar differences in the age pattern of infant mortality. In particular, in populations where breastfeeding was uncommon or of very short duration, cumulative infant mortality rises particularly steeply during the early months of the first year of life.

Figure 2, based on five studies done some years ago, contrasts the age patterns of mortality from age 1 month to 1 year for breastfed and artificially fed infants by plotting cumulative mortality against a logarithmic transformation of age designed to show the differences in age patterns more clearly. The results are remarkably consistent. For breastfed infants, mortality rises more quickly during the later months of the first year of life than dur-

ing the earlier months. For artificially fed infants, the reverse is true: mortality rises more steeply during the initial months and more slowly toward the end of the first year. Presumably, the faster rise in mortality among breastfed infants during the second half of the year, compared to the first half, reflects the diminished advantage of breastfeeding for infant survival during the latter months of infancy.

A study of infant mortality in eight U.S. cities in the early part of the twentieth century provides monthly mortality rates following weaning for infants weaned at different months during the first years of life (Woodbury, 1925). If we assume that infants weaned in any given month were randomly drawn from the group of infants breastfed the previous month, their mortality prior to weaning can be represented by the mortality of all breastfed infants up to the month that weaning occurs. We can then examine the age pattern of mortality for infants weaned in a given month by combining the mortality rates of all breastfed infants prior to the given month with the actual mortality of the weaned infants from the given month onward. Results expressed in terms of cumulative mortality after the first month, of infants weaned at ages 2, 3, 4, and 5 months are plotted in Figure 3 against the logarithmic transformation of age. For comparative purposes, the age pattern of mortality for

FIGURE 2. *Cumulative mortality of infants from age 1 month to 1 year by type of feeding, for American and German cities*

A. ARTIFICIALLY FED INFANTS

Cologne, 1908-09[b]
Berlin, 1895-96[a]
Barmen, 1905[a]
Hannover, 1912[a]
8 U.S. cities, 1911-16[a]
8 U.S. cities, 1911-16[b]

[a]All artificially fed
[b]Artificially fed from birth

B. BREASTFED INFANTS

Hannover, 1912
Cologne, 1908-09
Barmen, 1905
8 U.S. cities, 1911-16
Berlin, 1895-96

Age (in months)

Cumulative infant deaths after the age of 1 month per 1,000 live births

SOURCE: Knodel and Kintner, 1977; reprinted by permission.
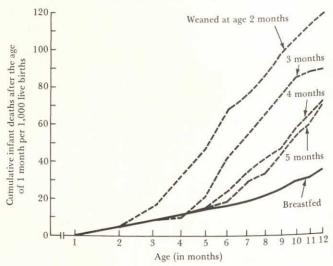
breastfed infants is included through the first year. The results clearly show a sharper upturn in mortality following weaning than would be predicted by extrapolating a line fitting the data points of the breastfed infants for the months prior to weaning.

Unfortunately, there are few studies on the effect of feeding practices on infant mortality in Third World countries today. The scattered studies that do exist suggest that death rates are higher for artificially fed infants than for breastfed infants. In fifteen rural communities in Chile, postneonatal deaths were three times as frequent among infants who started bottle-feeding in the first three months as among those exclusively breastfed dur-

ing that time (Plank and Milanesi, 1973). A considerably higher relative risk of dying has been reported for children breastfed less than six months than for those breastfed longer, in a study done in 1975 in Guatemala City (Lechtig et al., 1978). In another study of six rural communities in Guatemala, infants who were never breastfed were found to be far more likely to die in infancy than those who were breastfed, even after excluding those infants who were reported as not being breastfed because they were too sick or because they died immediately after birth (del Pinal, 1981). It must be stressed, however, that almost no methodologically sound studies have been published directly comparing the mortality associated with different types of infant-feeding regimes in currently developing countries. Documentation of the type shown in Table 2 for developed countries over the last seventy years is simply not yet available for Third World countries.

While the little evidence that is available from Third World populations indicates increased mortality risks for bottlefed infants, there is also indirect evidence that bottle-feeding is not at present a primary contributor to the overall level of infant mortality in at least some developing countries. A large number of studies, including those reviewing data from the World Fertility Survey, indicate that breastfeeding is considerably less extensive in urban areas than in rural areas of many countries. At the same time, infant mortality is typically far lower in the cities than in the countryside. For example, recent studies in Thailand indicate that around 1975 the average age at weaning was 21 months for rural infants compared with just under 10 months for urban infants. Moreover, only 6

FIGURE 3. *Cumulative mortality of infants from age 1 month to 1 year by age at weaning, eight U.S. cities, 1911–1916*

Weaned at age 2 months
3 months
4 months
5 months
Breastfed

Cumulative infant deaths after the age of 1 month per 1,000 live births

Age (in months)

SOURCE: Knodel and Kintner, 1977; reprinted by permission.

percent of rural women reported they did not breastfeed their last-born child compared to 21 percent of urban women (Knodel and Debavalya, 1980). Yet for 1974–1976 rural infant mortality is estimated to be 59 deaths per 1,000 live births compared to only 20 for urban infants. The fact that infant mortality is several times higher in the countryside despite near universal and prolonged breastfeeding than it is in towns and cities where breastfeeding is far less common does not mean that breastfed infants do not have higher survival chances in both rural and urban settings. It does suggest, however, that bottlefeeding is not a major contributor to infant mortality in Thailand at present. Differences in access to modern health services or in general standards of living are apparently far more important determinants of the contrasting levels of rural and urban infant mortality.

Downward Trend. The wholesale abandonment of prolonged breastfeeding as the primary method of infant feeding is largely a recent phenomenon even in the more-industralized countries. Considerable statistical evidence documents a dramatic downward trend in European countries since the 1930s (Vahlquist, 1975). More recent data for several European countries indicate that typically only a minority of infants are breastfed at all past the age of 3 months and many of those who are breastfed receive supplemental food at the same time. A similar dramatic decline in breastfeeding is evident in the United States. The percentage of infants receiving any breast milk by the time of discharge from the hospital decreased from 65 percent in 1946 to 37 percent in 1956 to 27 percent in 1966. During the 1970s, the trend took an upward turn as the proportion of babies breastfed at one week of age in the United States increased from about 25 percent in 1970 to 50 percent in 1979 (Martinez and Nalezienski, 1981). The declining trend in breastfeeding in some European countries may also be reversing but clearly the major shift has been away from breastfeeding.

Even more recent and perhaps more rapid are the changes in infant-feeding practices that appear to be occurring in many urban and peri-urban areas of the developing world. Substantial decreases in the proportions of urban women who breastfeed their infants for prolonged periods have been reported for Chile, Mexico, the Philippines, Singapore, and Thailand (Berg, 1973; Knodel and Debavalya, 1980). The decline is typically reflected both in lower proportions of infants who are nursed at all and in the shorter periods during which infants are wholly breastfed. As a recent critical review of the literature revealed, however, our knowledge of the changing prevalence of breastfeeding and its impact is seriously incomplete, and much of the information derives from studies based on peculiar samples and questionable or unstated methodologies, thus making interpretation and generalization of results hazardous (Cole, 1979).

The lack of data on the prevalance of breastfeeding on the national level is being partially remedied by the World Fertility Survey, which has included several questions on breastfeeding in its core questionnaire administered in a large number of developing countries (Ferry, 1980). Additional information for special subgroups within the population of several developing countries is provided by the *WHO Collaborative Study on Breastfeeding* (1979). However, it is difficult, if not impossible, to determine trends in infant-feeding practices from single cross-sectional surveys. Thus for most of the developing world there is little firm basis for judging the magnitude of changes in breastfeeding. Two exceptions are Thailand and Taiwan. A recent study based on a series of national sample surveys revealed that in Thailand the mean age of weaning declined steadily during the last ten years or so from 22.4 to 17.5 months for rural children and from 12.9 to 8.4 months for urban children (Knodel and Debavalya, 1980). In Taiwan, the proportion ever breastfed declined from 93 percent in 1966 to only 50 percent by 1980, and the average age at weaning of breastfed children declined from 14.6 months to 8.8 months (Millman, 1981). Moreover these trends characterized both the rural and the urban population.

In part the shift to bottlefeeding may be a consequence of the adaptation of urban mothers to working outside the household, but in part it almost certainly reflects a normative change in which breastfeeding is viewed as traditional and backward and bottle-feeding as modern and sophisticated. Commercial advertising and aggressive sales tactics by milk companies may contribute to this change. Prolonged breastfeeding is still usual in rural areas, but improving communication and transportation systems increase the chances that city habits and life styles, possibly including the shift away from breastfeeding, will penetrate the countryside, as is suggested by the Thai and Taiwanese experience. Even without a change in habits among rural women, however, the substantial migration from rural to urban areas now under way will assure a further reduction in the proportion of mothers in the contemporary Third World who practice extended breastfeeding.

It is difficult to assess the current demographic impact and even harder to predict the future significance of the shift in infant-feeding practices that is apparently under way. There is no reason to expect that conditions within the Third World will remain static. It seems likely that modern contraceptive practices will be increasingly adopted, in response to the same "modernizing" forces that are resulting in the abandonment of breastfeeding. This trend should lessen or negate the fertility impact of

changing feeding practices. In Thailand, for example, during the same decade or so for which a decline in breastfeeding has been clearly documented, the practice of contraception increased from just under 15 to about 50 percent among married women in the reproductive ages, and marital fertility declined by almost 40 percent. Although a substantial increase in infant mortality caused by a rapid shift to artificial feeding could retard the spread of family planning, it seems likely that in most countries, as health services and conditions relating to health improve, the mortality impact of reduced breastfeeding should also diminish. Again the Thai and Taiwanese experiences are instructive. In both countries the decline in breastfeeding was accompanied by decreasing infant mortality. In the long run, it seems likely that in much of the Third World, declines in breastfeeding, increases in contraceptive use, and improving health conditions will occur together. The future demographic impact of changing infant-feeding patterns will depend on just how coincident these developments are.

<div align="right">John Knodel</div>

See also FERTILITY DETERMINANTS, *article on* PROXIMATE DETERMINANTS.

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C

CANADA

Canada is second in land area among the nations of the world, after the Soviet Union, its neighbor across the North Pole. A population of 24 million in 1980 put Canada at slightly more than one-tenth the size of the United States, its neighbor to the south. Although its population is small, Canada has grown rapidly—multiplying 4.5 times since 1900, while the population of the United States multiplied 2.9 times and that of the world 2.7 times.

Another outstanding demographic feature of Canada is its division between two official languages, English and French. In fact a large part of Canadian history can be written in terms of the struggle between these two language groups. This conflict was noted by the French historian André Siegfried in *Le Canada: Les deux races* (1906):

Canadian politics are tilting-ground for impassioned rivalries. An immemorial struggle persists between French and English. . . . The Constitution of 1867, the basis of the Confederation, endeavoured to promote unity between different provinces separated by distance, race, language and religion. . . . But the artificial unity which is the work of the Confederation has not solved the problem. . . . To whom is the country ultimately to belong? To the French, ever growing in magnitude by virtue of their philoprogenitiveness? To the English, increasingly reinforced by armies of immigrants? Rivals in numbers, but rivals also in their customs and ideals.

Thus the English-French dualism in Canada has clear demographic roots. For the whole period 1760–1960 we can speak of a population struggle involving high French fertility and high English immigration.

Population Growth. The area now known as Canada has always been sparsely populated. Estimates vary greatly, but it appears that at the coming of the first European settlers in the early 1600s, the native Indian and Inuit population was less than a million and probably closer to 200,000. European settlement brought disease and warfare, which decreased the size of the native population. Although estimates are not very reliable, this original population may have reached a low around 1900 of not much more than 100,000. As the Indian inhabitants were displaced, a series of treaties resulted in their becoming in a sense wards of the government, largely living on reserves. They long remained rather separate from the surrounding society, with a birth rate close to 50 per 1,000 population until about 1960. Since then they have been undergoing a very rapid demographic transition and an increasing proportion are living off the reserves. The 1971 census enumerated a total native population of just over 300,000.

The history of nonnative population is known with considerably more precision. European settlement of a permanent nature began with the twenty-eight French citizens who arrived with Samuel de Champlain to found Quebec (now Quebec City) in 1608. A half century later, the king's intendant, Jean Talon, who had been active in promoting immigration, wanted to determine the progress of the population of New France. His enumeration of 1666 was possibly the first systematic census of modern

times. The total population of the colony was found to be only 3,215.

For the entire period of New France (1608–1760) immigration from France was estimated at less than 10,000 persons. After 150 years of colonization the population amounted to about 80,000 persons of French descent. In 1763 Canada was officially ceded to Great Britain by the Peace of Paris. Including some 20,000 British colonists, Canada's nonnative population then numbered around 100,000. By contrast, the population of the English colonies to the south, which were to become the United States, was something over 1.5 million.

The population grew rapidly in the first century of British rule. Heavy immigration and high fertility brought the total to 3.2 million in 1861 with an average growth rate of 3.7 percent per year (see Table 1).

Confederation in 1867 was followed by a period of slow growth, averaging 1.3 percent per year until 1901. This included the period of the "long depression," which involved decreased demands for Canadian grain and raw materials. Although a flow of immigrants persisted, about half of them moved on to the industrializing New England states south of the border. In addition, some 1.2 million native-born Canadians immigrated to the United States during this period. This was a large figure in a population of only 3.2 million in 1861 and 5.4 million in 1901.

Heavy immigration from Europe brought the rate of growth to 3 percent per year after the start of the twentieth century. The transcontinental railway and earlier-maturing varieties of wheat pushed the farm frontier west and north, extending the area of settlement and in effect permitting the nation to maintain control over its vast western and northern reaches.

After the decade 1901–1911, population growth declined during each successive decade, reaching a low of 1 percent per year during 1931–1941. This great Depression decade involved the only net emigration of the century. Average family size (total fertility rate) decreased to 2.6 children per woman in 1937, a low that was not seen again until 1967. It is worth noting that a decrease in population growth preceded the economic crisis and may even have contributed somewhat to the Depression by weakening the incentive for long-range business investment.

Population growth regained its momentum during the war years to reach a high of 2.7 percent annually in the decade 1951–1961. The 1950s and 1960s were unique in Canada: a period of almost uninterrupted economic growth. This promoted high immigration and helped to sustain the baby boom, reaching a peak total fertility rate of 3.9 births in 1959 and 1960. Population growth contributed to the economic growth of the period by raising the demand for goods and by applying an upward pressure on government expenditure, especially in the area of education.

Population growth in the 1970s gradually returned to lower levels, reaching a rate of about 1.1 percent per year in 1976–1981. The total fertility rate was down to 1.8 births per woman in 1976–1978. More modest economic

TABLE 1. *Components of population growth in Canada, 1851–1976 (in thousands)*

Census year	Total population	Change since preceding census				
		Natural increase[1]	Net migration[2]	Ratio of natural increase to total growth	Ratio of net migration to total growth	Average annual growth rate
1851	2,436	—	—	—	—	—
1861	3,230	611	182	77.0	23.0	2.9%
1871	3,689	610	−150	132.6	−32.6	1.3
1881	4,325	690	− 54	108.5	− 8.5	1.6
1891	4,833	654	−146	128.7	−28.7	1.1
1901	5,371	668	−130	124.2	−24.2	1.1
1911	7,207	1,025	810	55.9	44.1	3.0
1921	8,788	1,270	311	80.3	19.7	2.0
1931	10,377	1,360	230	85.5	14.5	1.7
1941	11,507	1,222	− 92	108.1	− 8.1	1.0
1951*	14,009	1,972	169	92.1	7.9	1.7
1956	16,081	1,473	598	71.1	28.9	2.8
1961	18,238	1,675	482	77.7	22.3	2.5
1966	20,015	1,518	259	85.4	14.6	1.9
1971	21,568	1,090	463	70.2	29.8	1.5
1976	22,993	934	350	65.5	24.5	1.3

[1] Births minus deaths.   [2] Immigrants minus emigrants.   *Newfoundland included as from this year.
Sources of data: George, 1976, pp. 5, 7; Statistics Canada, 1977.
SOURCE: Beaujot, 1978, p. 6; reprinted by permission.

growth and high rates of unemployment put pressure on the government to establish immigration quotas. There was still considerable growth in the labor force and in housing because of the entry of the baby-boom generation into adulthood.

Canada's population is unevenly distributed. The settled area forms a long thin ribbon against the border with the United States. Settlement is densest in a corridor between Windsor (opposite Detroit) and Quebec City. This corridor covers just 2 percent of Canada's total land area, yet it contained 55 percent of the nation's population in 1971. Uneven distribution has important political and economic consequences: representation of the special concerns of relatively unpopulated regions is weak, competition for available space in populated areas is strong, and transportation costs in outlying areas are high.

Canada's population became urbanized in relatively few years. In 1921, more than half the population lived in rural areas. In 1951, a fifth of the population was still on the farm and a quarter in cities of 100,000 or more. By 1971, the farm population was down to 7 percent and the population of cities of 100,000 or more was up to nearly half, with 30 percent of the national total concentrated in Montreal, Toronto, and Vancouver.

Changing Age Structure. The overriding feature of recent demographic history in Canada is the bulge introduced into the age structure by the large generation born after 1939 and especially after World War II. While the baby boom was a general phenomenon in Western nations, in Canada it was particularly sustained. From 1921 to 1939, numbers of births had been essentially static at about 240,000 each year. In the ensuing twenty years annual births doubled to 480,000 in 1959. Total births from 1940 to 1959 added up to 53 percent more than in the two previous decades. By comparison, the United States baby boom amounted to a 36 percent increase over the same period. After 1959 a new pattern developed. In spite of a growing population, a "baby bust" took place, with annual births declining to 340,000 in 1973.

These shifts in births are apparent in the age pyramid in Figure 1, which shows the wide difference in distribu-

FIGURE 1. *Age pyramid of the population of Canada, 1961 and 1976*

(A) Preschool (ages 0-5)
(B) Elementary school (ages 6-13)
(C) High school (ages 14-17)
(D) College (ages 18-24)
(E) Working ages (ages 20-64)
(F) Retirement age population (ages 65+)

Sources of data: 1961 Census of Canada, unpublished data; 1976 Census of Canada, catalogue 92–832, table 1.
SOURCE: Statistics Canada, 1979.

tion between 1961 and 1976. The movement of the baby-boom and baby-bust cohorts through the life cycle continues to have important consequences on Canadian institutions, from schooling to retirement.

Education. Elementary school enrollment peaked in 1968 and by 1976 had declined by 22 percent. The same wave hit the secondary schools, producing, along with an increase in participation rates, an 80 percent increase in enrollment in the period 1961–1971. In postsecondary education there was more than a tripling of full-time enrollment between 1962 and 1976, from 197,000 to 605,000 students. Three quarters of this change was due to the jump in the size of the 18–24 age group, the other quarter was due to an increase in enrollment rates from 11.1 percent of persons aged 18–24 in 1962 to 19.4 percent in 1976. The postsecondary enrollment rate subsequently stabilized mostly because of decreased government spending on higher education and the hesitations of young people in the face of labor market surpluses. Since the age group 18–24 peaks in 1982, then undergoes a 17 percent decline to the end of the decade, postsecondary educational institutions are likely to experience a serious decline in enrollment in the 1980s.

Marriage. As the baby-boom generation moved into young adulthood, it produced a slight imbalance of males and females at prime marriage ages, since women typically marry at younger ages. This may have been partly responsible for the narrowing of the difference between the ages of Canadian men and women at marriage; while the median age at first marriage decreased from 24.0 to 23.5 for men between 1961 and 1971, it increased from 21.1 to 21.3 for women. Medians subsequently increased for both sexes to 24.0 for men and 21.9 for women in 1978. This delay of marriage reflected the restricted economic opportunities experienced by the later segment of the baby-boom generation.

Housing. The arrival of the population wave at the prime ages for forming households was an important factor in the rise in the number of households. Between 1961 and 1976 the population increased by 26.1 percent, but the number of households increased by 57.3 percent. Increases were particularly large for nonfamily households, which went up by 250 percent in this 1961–1976 period. With the baby-boom cohorts reaching the ages for setting up households, and the changing propensity of the nonmarried to live on their own, there was severe pressure on the housing market. The costs of housing increased dramatically in the 1970s. Buying their own homes became difficult for many of the baby-boom generation. It was increasingly necessary for both spouses to work in order to purchase a house.

Family size. The number of women in prime childbearing ages (18–32) nearly doubled from 1.8 million in 1961

to 3.4 million in 1981. This made the relatively low level of yearly births in 1980 all the more surprising and suggested that smaller families were another choice the baby-boom cohorts were making, in part because of the various disadvantages they had faced with their relatively large numbers.

Employment. The entry of the baby-boom generation into the labor force put considerable pressure on job creation in Canada. The labor force grew by 3 percent per year in the period of 1961–1976. While the labor force expanded substantially, the baby-boom generation also experienced deprivation. In 1977, unemployment stood at 14.5 percent for ages 15–24 compared to 5.8 percent for persons 25 and over. Starting salaries and job security also suffered. The baby-bust cohorts were expected to have an easier time as they entered structures built for larger cohorts. It was projected that the growth of the labor force would decrease to half of its previous rate, to 1.6 percent per year over the period 1976–1991.

Increasing female participation was another factor underlying labor force growth. The overall male participation rate for ages 15 and over decreased from 78.1 to 75.5 percent in the period 1961 to 1976, but the percentage of female rates increased from 29.7 to 45.0. In a sense female participation competed with the baby-boom's movement into the labor force. But, from another point of view, the increase in female participation may have been partly a result of the baby-boom phenomenon. That is, since baby-boom husbands suffered relative deprivation on the job market as a result of the reduction of opportunity that was associated with large cohort size, wives had to remain in the labor force in order to maintain a reasonable level of family income.

Retirement. There were 15 persons aged 65 and over for every 100 persons of working age (20–64) in 1961 and 16 in 1981. This figure will increase slightly, to 19 or 20, by the end of the century, but if fertility remains around its current level there will be about 32 persons of retirement age for every 100 working age persons in 2026. By that time the baby-bust cohorts should be hard pressed to make the pension and social security contributions that will be necessary to support their elders. This could present a basis for intergenerational conflict, and as a consequence the baby-boom cohorts may be disadvantaged even in retirement.

The English-French Question. At the turn of the century, the total fertility rate was 5.5 for Quebec, representative of French Canada, compared to 3.9 for Ontario, representative of English Canada. In 1945 the figures were 3.7 and 2.5 respectively. On the immigration side, the number of French-speaking arrivals has always been small in comparison to the number of those speaking English. In the period 1910–1949, the Immigration Act

gave preferential treatment to the British. Although such provisions were removed after World War II, the period 1946–1971 saw one arrival from France for every eleven from the United Kingdom. By 1971 the population consisted of 45 percent of British ethnic origin, 29 percent of French, and 26 percent of other groups, all small in comparison to the British and French. Only three such groups numbered more than half a million in 1971: Germans at 6.1 percent of the total, Italians at 3.4 percent and Ukrainians at 2.7 percent.

While ethnic origin has its importance, polarization has centered on the official languages, English and French. In 1971, 67 percent of Canadians reported that they most often spoke English at home while 26 percent reported French and 7 percent reported other languages. With Quebec fertility at or below the national level and British immigration a small percentage of total arrivals, the conflict is no longer demographic. It is instead a question of language assimilation. Here again the French have been losing ground and the language issue continues to be a major source of concern and confrontation for both federal and provincial governments. For some it remains an open question as to whether or not two languages can continue to exist in one country.

Policy and Action. Political concerns on population matters have been centered mostly on immigration. Public support for immigration has fluctuated with Canada's economic fortunes. Labor unions have traditionally been apprehensive about it, particularly during economic downturns. French Canadians have been concerned that their numbers have not been increased through immigration. As a consequence, Canada has had no settled view on immigration and governments have had to attempt to compromise between opposing interests. A basic change in policy was introduced in 1962 with the removal of differential treatment by place of origin. The new regulations put emphasis on "education, training, skills or other special qualifications" of potential migrants in an attempt to fill special needs in the Canadian economy. Immigration was under review again in the 1970s and a new Immigration Act was implemented in 1978. The main additional feature of this act is that it established the notion of immigrant quotas to be set by government on a year-to-year basis.

There has been no official attempt deliberately to affect the birth rate. However, government money has been made available since 1970 to help support the Planned Parenthood Federation of Canada. The main area of contention has involved abortion. The 1969 amendments to the criminal code made abortion legal if a majority of a committee of at least three physicians certified that continuation of a pregnancy "would or would be likely" to endanger the life or health of the pregnant woman.

This provision has been variously interpreted by these committees. Since public attitudes toward abortion are divided, with some groups pressing for abortion on demand while others call for a complete ban, the present law remains a compromise.

Divers attitudes are also directed to population size and growth. Many people, especially in periods of economic prosperity, believe there is much room for population expansion, given the geographic size of the nation and its relatively small population. Environmentalists, on the other hand, have called for slow growth, pointing to the fragility, especially in the north, of environments affected by very high per capita energy consumption and by the encroachment of cities on prime agricultural land. Because opinions differ, Canada has no national population policy. The government consensus seems to be that, except in the area of immigration, population matters either are too sensitive for policy or will take care of themselves. At the same time, the Canadian government has allocated funds for international assistance in population, mostly through the Population and Health Sciences Division of the Canadian International Development Agency.

Scholarly Activities. Canada has taken quinquennial censuses since 1956; decennial censuses go back to 1851, and earlier censuses date back to 1666 but at irregular intervals. Underenumeration for the 1971 census was estimated at 1.93 percent for population and 1.4 percent for households. A system of vital registration has been in operation since 1921. Canada has not had many special demographic surveys. The province of Quebec has had fertility and migration surveys, and fertility surveys have been taken in Toronto and Edmonton.

The Association des Démographes du Quebec (ADQ) was organized in 1971 and the Canadian Population Society (CPS) in 1974. Each has around 150 members; their respective journals are *Cahiers québécois de démographie* and *Canadian Studies in Population*. In 1977 a loose federation was established between these two professional associations, called the Canadian Federation of Demographers.

Population studies are taught at most universities, usually in sociology and geography departments. Three centers have been especially involved in the training of graduate students: the Department of Demography at the University of Montreal, the Department of Sociology at the University of Alberta, and the Department of Sociology at the University of Western Ontario. Members of these departments have carried out extensive demographic research. One project involves the computerization and analysis of all parish registers of the early population of Quebec. Considerable demographic research has also been carried out under the auspices of the federal

government. Statistics Canada (previously the Dominion Bureau of Statistics) has published a series of census analytic studies dating back to the 1931 census. Both the Canadian International Development Agency and the International Development Research Centre have sponsored population research in other countries.

<div align="right">Roderic Beaujot</div>

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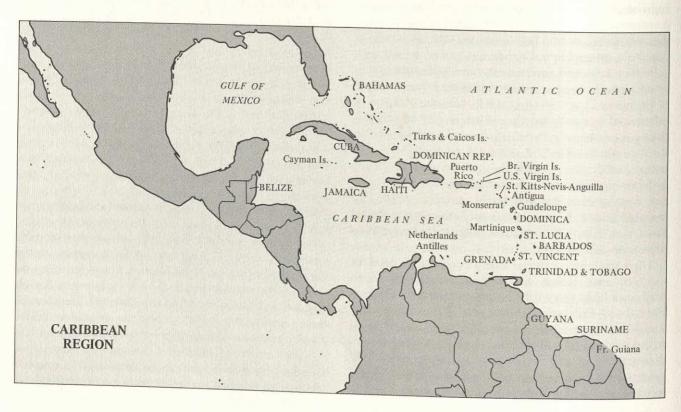
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CARIBBEAN REGION

The Caribbean region consists of an island arc in the Caribbean Sea, stretching from Cuba and the Bahamas off the coast of the United States south and east to Trinidad and Tobago off the coast of Venezuela. Belize on the Central American mainland and Guyana, Suriname, and French Guiana on the South American mainland are historically closely related to the Caribbean islands and are here considered to be part of the region.

The diversity characteristic of the Caribbean nations stems from their conquest and colonization by the British, the Spanish, the French, and the Dutch; subsequent decimation of the native population; and the importation of slaves from Africa and later of indentured workers from Asia. The population of the Caribbean region is now predominantly of African descent except in Trinidad and Tobago and Guyana, where approximately one third to one half of the population is East Indian. The land area is about 730,600 square kilometers (282,085 square miles), with Guyana acounting for one third of the total. The estimated population of the region was 31 million in 1980. Density varies from 3.7 persons per square kilometer (9.6 per square mile) in Guyana to 580 (1502) in Barbados, one of the most densely populated countries in the Third World. The ratio of arable land to labor is very low. Only Cuba and the Dominican Republic have large quantities of unused arable land.

Population Characteristics. Population size in the Caribbean, as shown in Table 1, ranges from 6,000 in the Turks and Caicos Islands to close to 10 million in Cuba. Four countries (Cuba, the Dominican Republic, Haiti, and Puerto Rico) acount for around 75 percent of the total. The members of the English-speaking Caribbean Commonwealth add about 19 percent (Antigua, the Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, Saint Kitts–Nevis–Anguilla, Saint Lucia, Saint Vincent, Trinidad and Tobago, and the Turks and Caicos Islands). The remainder consists of Suriname, the Netherlands, Antilles, the overseas French departments (French Guiana, Guadeloupe, and Martinique), and the U.S. Virgin Islands.

Caribbean growth rates fluctuated around 2 percent throughout the 1950–1977 period. Diversity among countries was due primarily to the differential impact of net international migration. Barbados, the Bahamas, and the Virgin Islands, for example, all had rates of growth that may have approached 4 percent in 1976, while Martinique and Montserrat were experiencing a decrease in total population with an estimated negative growth rate in excess of 1 percent.

In 1960 crude birth rates in some Caribbean countries were near the highest recorded in the world, but Cuba and Trinidad and Tobago, with rates in the mid-30s per 1,000 population, were more typical of the region. By the late 1970s birth rates ranged from about 15 to about 40. The variability among countries in pace and extent of fertility decline is shown in Table 2.

Crude death rates also showed considerable country differentials in 1960 but, with the exception of Haiti, they are now converging at quite low levels. Life expectancy at birth averaged about 67 years in the late 1970s and varied from 47 (male) and 50 (female) in Haiti to 70 (male) and 77 (female) in Puerto Rico.

The age structure of the Caribbean population has been affected strongly by out-migration as well as by high birth rates, with the result that the population under 15 and over 55 has grown faster than that between 15 and 54. In most countries the proportion in the prime working ages, 24 to 54, actually declined from 1960 to 1970. On the average, 40 percent of the population was

TABLE 1. *Demographic indicators, Caribbean region, various years, 1972–1978*

Country	Estimate of population, 1980 (thousands)	Crude birth rate per 1,000 population	Crude death rate per 1,000 population	Infant mortality rate per 1,000 live births	Rate of natural increase
Antigua	75	19.8	6.8	24.5	1.3
Bahamas	229	24.8	4.6	24.7	2.0
Barbados	253	18.6	9.2	28.3	0.9
Belize	162	38.7	6.1	33.7	3.3
Br. Virgin Islands	13	21.5	6.5	18.6	1.5
Cayman Islands	12	20.1	5.8	17.8	1.4
Cuba	9,978	17.6	5.8	24.8	1.2
Dominica	80	21.4	5.3	19.6	1.6
Dominican Republic	5,946	38.3[a]	10.7[b]	37.2	3.1[b]
French Guiana	71	24.5	7.6	32.8	1.7
Grenada	98	27.4	5.9	23.5	2.2
Guadeloupe	334	17.3	6.2	20.9	1.1
Guyana	791	28.3	7.3	50.5	2.1
Haiti	5,817	42.7[b]	17.4[b]	n.a.	2.5[b]
Jamaica	2,192	29.8	7.1	20.4	2.3
Martinique	327	14.5	5.8	18.9	0.9
Montserrat	13	17.1	13.1	48.5	0.4
Netherlands Antilles	266	20.0	4.8	19.8	1.5
Puerto Rico	3,438	22.6	6.0	20.1	1.7
St. Kitts–Nevis–Anguilla	67	24.4	10.3	40.5	1.4
St. Lucia	115	35.0	7.3	36.5	2.8
St. Vincent	98	32.7	10.0	99.6	2.3
Suriname	389	36.9[c]	7.2[c]	30.4[c]	3.0[c]
Trinidad & Tobago	1,139	25.3	6.6	28.6	1.9
Turks & Caicos	6	26.5	9.0	31.5	1.8
U.S. Virgin Islands	107	26.6	5.4	25.0	2.1

[a] 1978.   [b] 1970–1975, estimates.   [c] 1966.   n.a. = not available.
Sources of data. Column 1: United Nations, 1979*b*. Columns 2–5: United Nations, 1979*a*. The 1978 crude birth rate in the Dominican Republic is reported in Inter-American Development Bank, 1978. Estimated rates for the Dominican Republic and Haiti, 1970–1975, were prepared by the Population Division of the United Nations.

TABLE 2. *Fertility rates per 1,000 women aged 15–44, selected Caribbean countries, 1960, 1970, 1975*

Country	1960	1970	1975
Bahamas	144.0	122.2	95.8
Barbados	159.7	103.8	96.4
Cuba	142.7	137.0	100.9
Dominican Republic	177.6	194.2	166.6
Jamaica	198.5	175.7	153.5
Trinidad & Tobago	193.1	120.2	115.5

Source of data: Pan American Health Organization, 1978.

under 15 in the late 1970s. A consequence of this is a high dependency ratio, estimated at 935 per 1,000 for the region, but reaching 1,100 per 1,000 in a few countries.

Migration. The demographic characteristic shared by almost all of the Caribbean nations is their high rates of emigration. As noted above, migration has reduced the proportion of the population in the working ages, and has moderated total population growth. In the English-speaking Caribbean in the 1960s and 1970s, a high rate of natural increase of 2.8 percent per year was translated by migration into a slow population growth rate of 1.4 percent per year. Approximately one-third of the Puerto Rican population migrated to the United States between 1946 and 1972. Puerto Rico is a commonwealth freely associated with the United States and movement between them is unrestricted. There has always been a large return migration from the mainland to the island.

The exceptional mobility of the Caribbean population is not a recent phenomenon. Following the abolition of the slave trade and the importation of laborers from China and India in the late nineteenth and early twentieth centuries, there were massive black migrations both within and outside the region. Cuban sugar plantations and construction of the Panama Canal in particular drew many freed slaves. During the 1920s migration shifted to the United States until it was cut off by the Depression of the 1930s, which drove migrants back to the islands. Immigration to the Caribbean, principally from Spain to Cuba, was also curtailed by the economic devastation of the 1930s. Estimates are crude because an unknown percentage is undocumented and many migrants return to their homes, but approximations of net Caribbean emigration for the postwar period to 1962 are in the neighborhood of 3 million. When the United Kingdom drastically curtailed immigration from its former colonies after 1962, the proportions of migrants going to the United States and Canada increased sharply. Cuba, the Dominican Republic, Jamaica. Trinidad and Tobago, and Haiti contributed 30 percent of the documented immigrants from the western hemisphere (or about 450,000 people) to the United States between 1966 and 1975).

This out-migration has had both positive and negative effects. The reduction in the working-age population has taken some of the edge from acute unemployment problems, remittances have contributed to income of family members left behind, and some pressure has been taken off health and education resources. However, there has also been a loss of educated and skilled young people disproportionate to their numbers in the total population. Trinidad and Tobago, in the late 1960s, lost as much as 35 percent of its university-educated manpower (1965 population base). Haiti's losses include more than 50 percent of recent medical and nursing school graduates, and an estimated 60 to 75 percent of its high-level manpower.

Stringent immigration controls imposed by the United States, the United Kingdom, and Canada since the early 1970s have reduced total legal emigration outside the region, and the significance of emigration for moderating population growth has diminished. Legal intra-Caribbean migration is also limited, although movement of Haitians to the Dominican Republic is believed to be substantial and there are seasonal migrations of agricultural labor among the islands.

Internal migration in the Caribbean is sometimes cyclical—to the plantations and tourist centers for seasonal work—but the major moves have been to the urban areas. The annual growth rate of the urban population in Jamaica, for example, was twice that of the total population growth between 1960 and 1970. Overall, about half the Caribbean population is considered urban, and the proportion is expected to rise to 63 percent by the year 2000. It is now about 64 percent in Cuba but is as low as 15 percent on some of the smaller islands.

Urbanization has produced in each country a principal city, usually the capital, which is many times larger than the next largest city. The San Juan metropolitan area in 1980 was more than seven times larger than any other Puerto Rican urban center. In Cuba, housing policies, residence permits, and economic development policies have been effective in controlling migration, but approximately 20 percent of the people are in Havana. Haitians, Jamaicans, and Barbadians in New York City and Cubans in Miami are, in population size, equivalent to the "second city" for their respective countries.

In the smaller islands, such as Barbados, rural-urban distribution is not marked. About 80 percent of the people of Barbados live on a coastal strip that is one large urban area, and transportation and communication effectively extend urban characteristics throughout the island. This extension of urban life styles is common in much of the Caribbean region.

Sources of Demographic Data. There is a long history of census taking in the Caribbean, dating back to the

eighteenth century, and systems of registry of vital events were introduced during the nineteenth century. The United Nations considers the registration of vital events to be virtually complete in the majority of the countries. However, even countries with relatively good demographic data, such as Jamaica, recognize that underregistration of infant births and deaths, and difficulties in recording migration, seriously affect the accuracy of intercensal estimates. The Caribbean, like Central and South America, records low percentages of married women because of the frequency of visiting arrangements and consensual unions in the region [see AGE AT MARRIAGE]. Data on fertility have been obtained, or are soon forthcoming, in those countries that have participated in the World Fertility Survey (the Dominican Republic, Guadeloupe, Guyana, Haiti, Jamaica, Martinique, and Trinidad and Tobago).

Health Conditions. Health conditions in the Caribbean compare favorably with those in most developing countries. With the exception of the South American mainland countries and Haiti, malaria has been eradicated throughout the region. Deaths of children under 5 years from diarrheal diseases are substantially fewer than in Central and South America, and the rate was almost halved from 1968 to 1975. In 1975, 3.1 percent of the deaths of children under 5 were due to diarrheal diseases, as compared with 12.7 percent in Central America. In several countries, however, the percentage of malnutrition among children has been found to be well above the Latin American average. Infant mortality rates fell from 1960 to 1975, with considerable narrowing of the differences between countries. (Haiti's infant mortality rate is thought to be about 150 to 200 per 1,000 live births, but reliable data are not available.)

The small size of Caribbean countries has made it relatively easy to extend public health services, but uneven distribution of health professionals between rural and urban areas is evident. Jamaica, for example, around 1976, had 6.4 physicians per 10,000 population in its cities, and 1.4 in the rest of the country. Ratios in the Dominican Republic were 4.7 urban and 1.6 rural, and in Haiti, 4.1 urban and 0.4 rural. Cuba's health system is noted for its well-balanced distribution of services throughout the island.

Socioeconomic Conditions. All of the Caribbean countries are classified as developing, although with considerable differences in the values of basic economic indicators, as shown in Table 3. Agriculture is the most important occupation, again with substantial variation among countries. Agricultural products are chiefly sugar, bananas, and citrus fruits for export. The volume of this output has declined in recent years, and it can fluctuate sharply according to weather conditions, which include frequent hurricanes. Serious deficits exist in the production of food for domestic consumption.

There has been a shift in the relative importance of agriculture since 1960 in some countries, with the percentage of labor force in that occupation declining, while the proportion in service occupations and, to a lesser extent, in industry increases. Bauxite, tourism, and petroleum are major contributors to the gross domestic product in several countries. Bauxite alone generated 72 percent of Jamaican export earnings in 1977. Jamaica, Barbados, and Trinidad and Tobago have most of the industries in the region but they produce consumer goods on a relatively small scale. Industrial growth has been limited by small national markets, dependency on imports, and inability to compete with the already industrialized nations in the export of manufactured goods. Estimates of unemployment are not strictly comparable across countries, but they vary from 15 to 25 percent of the active labor force; estimates of underemployment are of similar magnitude. The Caribbean Community and Common Market (CARICOM) was formed in 1973 to foster economic development and to reduce the region's external dependence.

Policy and Action. Most Caribbean countries have at least an implicit policy of controlling the growth of their principal urban center, mainly through rural development programs and by directing the location of industries. Cuba is the only country to have an explicit policy of population distribution, which is implemented through reallocation of government spending from Havana to designated secondary towns and rural areas.

TABLE 3. *Economic indicators, selected Caribbean countries*

Country	Per capita GNP, US$, 1977	Adult literacy rate, 1975	Percentage of labor force, 1977		
			Agriculture	Industry	Service
Cuba	$ 910	96%	26%	31%	43%
Dominican Republic	840	67	58	16	26
Haiti	230	23	70	8	22
Jamaica	1,150	86	24	27	49
Trinidad & Tobago	2,380	95	13	37	50

Source of data: World Bank, 1979.

Encouragement of emigration has been described as the keystone of population policies in the region, but government efforts to moderate population growth in this way are limited by laws of receiving countries that prevent mass immigration and select the highly skilled.

By the late 1970s, Barbados, Jamaica, the Dominican Republic, and Trinidad and Tobago had adopted policies to reduce fertility as a means of decreasing overall population growth, and all of these countries have established government-sponsored family planning programs. In other countries the justification for government participation has been in the context of the state obligation to provide these services as a health measure. Many countries have integrated family planning with their maternal and child health services or national health care delivery systems. Few countries have pronatalist policies, though Guyana, a mainland country with an undeveloped interior, has encouraged population growth. Belize has made no explicit government statement, but it has no organized family planning activities, public or private. With the exception of Cuba, where large numbers of abortions are performed within the framework of the official health services, all Caribbean countries have restrictive abortion laws.

Government support of private family planning associations is common throughout the region and includes direct financial contributions to association budgets, use of government centers for family planning programs, and collaboration in providing courses in family life and sex education. A regional organization of private associations, the Caribbean Family Planning Affiliation, was formed in 1973 for mutual assistance in developing national, subregional, and regional programs.

Scholarly Activities. The major demographic training resource for the Caribbean is the Centro Latinoamericano de Demografía (CELADE, the Latin American Demographic Center) in Santiago, Chile, and San José, Costa Rica. Demographers in Cuba, Haiti, Puerto Rico, and the Dominican Republic in particular have received basic and advanced training at CELADE. Resources within the region include the Centro de Estudios Demográficos (CEDEM, the Center for Demographic Studies) of the School of Economics of Havana, Cuba, which has a two-year graduate program in demography. The Institute of Social Research of the University of West Indies (UWI) also offers courses in demography. UWI research has included studies of migration, fertility, and the status of women, and the Census Research Programme, which has provided basic demographic data for use by the Commonwealth countries. The University of Puerto Rico offers a master's degree in demography at its School of Public Health. The Social Science Research Center at the university participates in a joint studies program in urban sociology and demography with Fordham University in New York and conducts a research program in the field of urban sociology and population. Research at the University of Puerto Rico has included studies of fertility, sterilization, migration, return migration, economic development, and labor force.

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See also LATIN AMERICA.

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CENSUSES

See DATA COLLECTION, *articles on* NATIONAL SYSTEMS *and* UNITED STATES CENSUS.

CENTRAL AMERICA

See LATIN AMERICA.

CHILD MORTALITY

See INFANT AND CHILD MORTALITY.

CHILDREN, VALUE OF

See VALUE OF CHILDREN.

CHINA

When the People's Republic of China was officially proclaimed on 1 October 1949, it contained about one-fourth of the world's population. China still has by far the largest population of any country in the world, nearly twice as large as the combined totals for the United States and the Soviet Union. However, some 80 percent of China's population is rural, for the most part directly dependent upon agriculture, and living at little better than a subsistence level. The rate of population growth, though below the average for the world as a whole, is sufficient to constitute a major impediment to national economic development, and it has for many years exceeded the rate of growth in food production.

Location and Description. China's 3.7 million square miles (9.6 million square kilometers) constitute a major portion of East Asia. China shares a common boundary with twelve other countries: North Korea to the east; the Soviet Union to the northeast and northwest; Mongolia to the north; Afghanistan, Pakistan, India, Nepal, Sikkim, and Bhutan to the west and southwest; and Burma, Laos, and Vietnam to the south. Across the sea to the east lies Japan and to the southeast Taiwan, the Philippines, Malaysia, and Indonesia.

Most of the western part of the country consists of mountainous or semidesert areas. About 90 percent of the population is concentrated in the eastern plains, which account for only about one-tenth of the total area of the country but contain most of its cultivated lands. In 1949, rural China consisted of tiny farms that averaged about 3.5 acres (1.4 hectares) each. After the "land reform" of the early 1950s, which broke up and redistributed the larger landholdings, a collectivization drive was begun, which by 1956 had combined all the holdings into some 750,000 cooperatives. In 1958, the cooperatives were merged in about 50,000 "people's communes," which varied in population size from less than 5,000 to more than 100,000. Initially, the communes imposed a highly centralized control over rural life, but by the early 1960s, some of their authority had been remanded to their component brigades and teams.

Population Characteristics. China has a long history of censuses and population records dating back at least to the eleventh century B.C., but the demographic significance of the figures they produced is uncertain. The early counts seem to have been taken primarily to determine the numbers of taxpayers or the resources available for labor or military conscription. In the first three decades of the twentieth century there were a number of so-called censuses of the population, but the figures they produced were also widely distrusted. Efforts were made to estimate the total population by multiplying the amount of cultivated land by assumed labor–land ratios or on the basis of the amount of salt consumed or the extent of postal services. None of these methods was wholly reliable.

Size, area, and density. During 1953 and 1954, the new government conducted a national census, which reportedly disclosed a total population of 582,603,417 as of 30 June 1953. This figure was almost 100 million larger than previously cited totals and seems to have come as a surprise to the Chinese authorities. Subsequently, a total of 646,530,000 as of year-end 1957 was obtained from the national population registration system, a second census counted a total of 691,220,000 as of midyear 1964, and a registration total of 982,550,000 was announced for year-end 1980.

China is the third largest in total land area among the countries of the world, after the Soviet Union and Canada. It measures more than 5,000 kilometers (3,100 miles) from east to west and more than 5,500 kilometers (3,410 miles) from north to south. The population is very unevenly distributed. In much of the western two-thirds of the country the density is less than 10 persons per square kilometer (25.9 per square mile); the most intensively cultivated one-sixth of the country along the eastern coastal region has more than 500 persons per square kilometer (1295 per square mile). This differential reflects the differences in the carrying capacity of the land. The western regions are for the most part high, cold, and dry with limited soil and sparse vegetation that cannot sustain a large population. During the 1950s and at times in the 1960s and 1970s there were efforts to settle in these regions the surplus population from the cities and the densely populated rural areas of the east. But the inhospitable climate made life on the frontiers difficult, and the resettlement efforts met stiff popular resistance. Much of the resettled population has since returned home.

Average size of household. In the early years of the twentieth century, the average size of household reported in various localities ranged from 4 to 6 persons. After 1949, because mortality declined sharply and fertility remained high, the trend in family size may well have been upward, although the available data do not afford a clear picture. Recently, the effort to promote family planning has undoubtedly brought about an initial reduction in average family size. Most of the localities for which figures are available seem to have an average of 4 to 5 persons per household. Lower figures are likely in the future.

Women of reproductive age. Fertility in China is limited almost exclusively to married women, and marriage is virtually universal for Chinese women. According to China's current laws, the minimum age of marriage for women is 20 years, and because of the dictates of custom,

most women marry soon after reaching that age. But because the Chinese method of reckoning age may exaggerate age in completed years by one or two years, some Chinese women may actually marry at age 18 or 19, and there are still some families that ignore the law and marry girls as young as 14. On the basis of official population data, it can be estimated that China has more than 185 million women between the ages of 20 and 49.

Age at marriage. The Marriage Law of 1950 set the minimum permissible age for marriage at 18 for women and 20 for men. Following its passage, there were several campaigns during the 1950s to enforce its provisions, but progress was gradual and for the next 30 years there were intermittent reports of marriages involving persons under the minimum ages. The new Marriage Law passed by the National People's Congress on 10 September 1980, which took effect as of 1 January 1981, raised the minimum ages to 20 for women and 22 for men. In fact, however, the immediate effect of the new law was to precipitate a sudden upsurge of marriage registrations throughout the country in the first months of 1981. In Beijing Municipality the change in the legal minimum age of marriage combined with changing age composition to increase the number of young people entering the marriageable ages from 200,000 in 1980 to 800,000 in 1981. The reason was that the new law invalidated previous administrative rules prohibiting marriage before age 23 for women and 25 for men in rural areas and 25 for women and 27 for men in urban areas. As a result, young people can now marry from 3 to 5 years earlier than was allowed during the previous 20 years.

The new marriage law also permits minority areas to specify lower minimum ages for marriage in deference to local customs. Tibet, Ningxia, and other areas have enacted local variants of the marriage law setting the minimum ages at 18 for women and 20 for men. The reasons for the relaxation of marriage age restrictions at a time when the pressure to reduce the birth rate is being stepped up are not known, but it is rumored that the former regulations were extremely unpopular, had further alienated young people already frustrated by the lack of employment opportunities, and were contributing to a rise in extramarital sex and pregnancies in some urban areas. In any case, conformity with the stipulated ages probably was never as high as claimed because of the use of Chinese ages, falsification of ages, and marriage without registration. The authorities concede that the change in age of marriage will make it more difficult to attain family planning targets in the next few years.

Population data. The principal sources of population data for China since 1949 have been the censuses of 1953 and 1964 and the population registration system established in urban areas in the early 1950s and in rural areas

between 1954 and 1956. The 1953 census was a *de jure* count as of 30 June 1953. The census work was protracted. In some areas census taking began before the census date, but most areas were counted after the end of 1953 and some were still being enumerated as late as April 1954. More than 2.5 million persons were employed in the census operations. The information collected included name, age, sex, nationality, and relationship to the head of the household. When the count was completed, a recheck of the work in areas with a population of 53 million reportedly found a net omission rate of 0.116 percent, but some of the checking was done in a highly perfunctory manner that could not have given a reliable indication of the margin of error.

The same basic methods were allegedly used during the next census, which was said to have been completed within a few weeks of the census date, 30 June 1964. The 1964 census added questions on education and occupation, but the responses to these questions were never tabulated. Some 5.3 million people were engaged in the effort. An accuracy check covering a population of 37 million, the methods of which have not been disclosed, found a net omission rate even lower than that for the 1953 census. The data from the 1953 census released thus far are limited and those from the 1964 census even more so.

Most of the population data for noncensus years have come from the system of national population registers set up on the basis of the 1953 census records. Registration work began in major cities as early as 1949 and was gradually extended to other cities in subsequent years. The initial regulations for the urban population registers were issued by the Ministry of Public Security on 16 July 1951. National registration regulations were issued by the State Council on 9 June 1955, and a revised set of regulations was announced by the Ministry of Public Security on 9 January 1958. The latter are said to be still in force. The registration system provided for the regular reporting of births, deaths, migration, and changes in household composition. Subsequently, the system was supposed to be used as the basis for rationing food, cloth, and other items, but it is not clear that it was so applied in all places, particularly in rural areas. There are apparently problems with the registration of births and deaths, and from the 1950s to the present, the natural increase rates implied by vital registration do not agree with the net growth in the population indicated by provincial and national population totals. Registration was interrupted during the Big Leap Forward (1958–1960) and the Cultural Revolution (1966–1969). The data available suggest that not only births and deaths but total population figures are underregistered.

A third nationwide census is planned for 30 June 1982.

A pilot census was conducted in Wuxi City and Wuxi County as of 30 June 1980 and other experimental censuses were conducted subsequently throughout the country. Chinese statistical officials hope that this census will resolve some of the anomalies in current population data.

Age and sex structure and the dependency ratio. Because of high fertility and low mortality during most of the last thirty years, China's population has a low average age, about 27 years. In 1953, 45 percent of the population was under 20 years of age. Estimates based on Chinese data suggest that this proportion has dropped to about 40 percent in 1981. With fertility now declining and mortality remaining low, the population may be expected to age rapidly during the remainder of this century. The proportion of the population that is economically dependent (persons at ages 0 to 14 and 65 and over) was about 40 percent in 1953, rose to about 44 percent by 1960, remained stable at around 42 percent through the 1960s and the early 1970s, and, after a slight rise in the late 1970s, has begun to decline rapidly. If present trends continue, it will fall to about 20 percent by 1990. During the past 20 years, and especially in the late 1970s, the rapidly growing cohorts of young people reaching the adult years have constituted a serious problem in the cities, where jobs have been scarce, and this problem will continue until the middle of the 1980s.

Fertility, mortality, and migration. According to official estimates, the birth rate was 37 per 1,000 population in 1952 and the death rate was 17. During the food-crisis years, 1960–1961, mortality rose sharply and fertility declined, but official data show a rebound in the birth rate to 43.6 per 1,000 and a peak in natural increase at 33.5 per 1,000 in 1963. Fertility and natural increase remained high during the rest of the 1960s reaching a secondary peak toward the end of the decade. Fertility began to decline sharply after 1971, according to official sources, and by 1979 the birth rate was reported as 17.9 per 1,000. The death rate was said to be around 7 per 1,000 in the middle 1970s and had declined further to 6.2 per 1,000 by 1979. In all probability, these figures are too low.

The rapid growth of the population has caused recurrent local food shortages in many parts of the country. National figures indicate that food grain distributed per capita actually declined between 1957 and 1977.

During the 1950s the main flows of internal migration were toward the provinces of the northeast and toward the major cities. From 1952 onward, there were efforts to halt the "blind drift" of rural population into the cities, but the movement continued, reaching flood-tide proportions during the first year of the Big Leap Forward in 1958. During the 1960s and 1970s migration into the

cities has been effectively discouraged, and more than 16 million urban young people have been relocated in rural areas, often in remote frontier provinces. Throughout the twentieth century there has been a spontaneous movement of population from central China into Manchuria. This movement continued during the 1950s and was supplemented by planned relocations in Gansu, Qinghai, Xinjiang, and Inner Mongolia, all of which had much more rapid population growth than the rest of the country. Some of the resettlement efforts were not well planned, investment in the new areas was insufficient to provide an adequate economic basis for the new residents, and the amount of backflow was considerable. Some of the new lands opened up for cultivation by the settlers were not suited to agriculture, and the soil was seriously damaged by salinization and erosion.

Growth pattern. Because of the changing trends in fertility and mortality in China during the present century, the rate of population growth was probably not much above one quarter to one half of 1 percent per year in ordinary times and less in periods of widespread famine, plague, or war. After 1949, mortality undoubtedly declined rapidly and fertility may have risen somewhat, with the result that population growth exceeded 2 percent per year before the middle of the decade. The food-crisis period of the early 1960s presumably resulted in a severe, though temporary, reduction in the rate of population growth. Chinese sources say that a net population loss occurred during 1960 or 1961, but they disagree as to the size of the loss, and some foreign analysts remain skeptical. In any case, high population growth resumed immediately after the crisis. Official sources claim that the population growth rate peaked well above 3 percent in the middle 1960s and remained above 2.5 percent through the rest of the decade. The growth rate reportedly dropped sharply once more after 1971, mainly in response to the family planning effort, and by 1979 it was under 1.2 percent. There are reasons to believe that the actual rate of growth is somewhat higher than the official figures indicate and that the target growth rates of 0.5 percent by 1985 and 0 by the year 2000 are not realistic.

Urban and rural distribution. The 1953 census indicated that China had 5,568 urban places, 9 of which had more than 1 million inhabitants: Beijing, Tianjin, Shenyang, Wuhan, Chongqing, Shanghai, Nanjing, Guangzhou, and Harbin. The total urban population was 77 million, 13.26 percent of the national population figure. During the middle 1950s the population of China's cities increased by an average of about 8 percent per year, despite efforts to restrain urban growth. In 1958 all such efforts were abandoned and there was a great surge of rural population into the cities. By 1960 the urban population had reportedly reached 131 million, about

19.8 percent of the national total. Once again major efforts were made to reduce the size of the urban population. One method of restricting urban growth was the mandatory transfer of urban youth to rural areas, sometimes in distant provinces on the western frontier. This policy was very unpopular with the urban youth and their families and also with the peasants in the areas to which the youth were sent. Even according to official figures, the rate of backflow by the late 1970s had reached 40 percent. Currently, a number of the transferred youth are being permitted to return home, and the largest municipalities, including Shanghai, are experiencing some growth as a result. How successful the policy of limiting urban growth has been is difficult to judge. Several major municipalities claim to have had virtually no population growth from the early 1960s until the late 1970s, and recently released figures indicate a greatly reduced urban population in 1965 and 1970 (around 102 million). However, there is some doubt as to whether the apparent reduction from over 130 million in 1960 is due to an actual decline in the numbers of urban residents or a change in the definition of what constitutes an urban place. One Chinese source indicates that in 1979 China had only 3,400 cities and towns with a population of over 110 million, and another says that the urban population had reached 129 million in 1979, or 13.2 percent of the national total. These figures were obviously derived by different methods, and neither seems to be comparable with the figures for the 1950s.

One of the long-term aims of Chinese plans for urban development was to shift the emphasis in urban growth away from the coastal cities toward the interior of China. Recent studies suggest that the policy has to some extent succeeded. The most recent statement about urban policy indicates an intention to develop further the industrial and service capabilities of small towns in China so that they can better meet the needs of the rural areas. This would seem to imply an increased rate of growth for the smaller urban centers in the future.

Ethnic and religious composition. According to the 1953 census, almost 94 percent of China's population were Han Chinese. The remaining 6 percent, some 35 million people, were subdivided into more than fifty minorities. Of these, the Mongolian, Hui, Tibetan, Uighur, Miao, Yi, Chuang, Buyi, Korean, and Manchu minorities each numbered more than a million people. Some of the smaller groups, such as the Elunchun, Benglong, Dulong, and Hezhe, consisted of a few thousand persons each. Although they make up only a small part of the population, China's minorities have a political significance disproportionate to their numbers because they occupy some 50 to 60 percent of China's total territory and because many of them are located along the frontiers, where they are in contact with similar minorities across the border.

Literacy and education. It is estimated that in 1949 about 85 percent of Chinese adults were illiterate. A nationwide literacy campaign was launched in 1953, but the effort was ill conceived and was subsequently criticized as a case of "blind adventurism." Another drive, aimed at eliminating illiteracy within seven years, was initiated in 1955, but once again the program was not well run, and in 1956 it was discovered that some of the graduates of literacy classes promptly lapsed into illiteracy again. During the Big Leap Forward of 1958, another campaign was mounted, and presently many provinces were claiming to have wiped out illiteracy, but in the 1960s some of the same provinces were again conducting literacy classes. In 1978, a vice-minister of education said that China still had a fair amount of illiteracy, and in 1979 it was said that there were still 100 million "young and able-bodied adults" who were illiterate or semiliterate. The actual proportion of the adult population in China that is presently illiterate is not known.

Early in the 1950s, China announced a policy of compulsory primary education, and by 1951 the numbers of primary schools and primary school enrollments had considerably increased. But between 1952 and 1955 primary enrollment levelled off because of a policy change that called for directing young people into the fields and factories rather than into schools. During 1956 primary enrollment rose sharply and there was a further sharp increase during the Big Leap Forward, mainly because of the institution of schools "run by the masses" in which educational standards were reportedly very low. During the Cultural Revolution, all schools in China were closed so that young people could participate in political activities, and although efforts were made to reopen the schools and return students to their studies in 1967 and 1968, the students preferred to stay in the streets and the teachers were afraid to return to teaching. It was subsequently stated that the schools were "in a state of chaos" during this period. The antieducational philosophy that dominated Chinese education in the 1960s and the early-to-middle 1970s was not reversed until the latter part of 1976. It was reported that primary enrollment had reached more than 146 million in 1977, or 95.5 percent of the children in the eligible ages; but in a report to a national education conference in June 1978, the minister of education called for the attainment of 95 percent enrollment "within three years," and a 1979 report that repeated the figure of 146 million said that it represented 94 percent of China's school-age children. The same report said that there were 7.87 million children in kindergartens, 65 million in middle schools, 880,000 in "secondary and vocational" schools, 850,000 in colleges and

universities, and 8,000 in graduate schools. Investigations in some localities, however, have found that the recent expansion of secondary schools was carried out precipitously without regard to the limits of circumstances. In many areas, some of the schools are still "run by the masses," which means that they are not funded and staffed by local government organs.

Policy and Action. When the People's Republic of China was established in 1949, the new leaders explicitly rejected any notion that the country might be faced with problems because of the size or rate of growth of its population. Mao Zedong wrote that there were absolutely no grounds for pessimism because all population problems could be solved by increasing production. A large population was, he insisted, a good thing for China. Other spokesmen denounced birth control as a foreign plot to "kill off the Chinese people without shedding blood."

Before the 1953 census results were announced, the attitude of the Chinese leadership had already begun to change. The years 1953 and 1954 had witnessed widespread local famines, and grain production had increased more slowly than population. The size of the census total also seems to have come as a surprise. While press dispatches interpreted the figure as good news and an indication of China's strength, the first tentative steps were taken toward a national birth control campaign, which finally got under way officially in the summer of 1956. Under the aegis of the Hundred Flowers movement in the spring of 1957, leading Chinese scholars began to speak out on the need to control population growth and on the problems that population growth posed for national economic development. When the Hundred Flowers succumbed to the "rectification" drive in the summer of 1957, the scholars were denounced as "rightists" and silenced, but the campaign continued without abatement until the start of the Big Leap Forward in the spring of 1958.

When the Leap was launched, Mao stated that a large and impoverished population was an asset in building socialism, and other spokesmen said that an abundant labor supply could be invested in lieu of scarce capital and bring about a miraculous increase in all kinds of production. As the exaggerated grain figures of the Leap began to come in, others boasted that China's peasants had overthrown the law of diminishing returns in agriculture and "put the final nail in the coffin of Malthus." Birth control efforts languished, and the production of contraceptives all but ceased.

By the end of 1959, food shortages were again reported in various localities, and in 1960 and 1961 acute malnutrition and starvation were widely reported in China. Early in 1962, a new birth control campaign was started, and a major effort was made to popularize late marriage.

Intrauterine devices, which had been tried out experimentally during the first campaign, were publicly promoted for the first time. The second birth control campaign was interrupted by the Cultural Revolution in the summer of 1966. For two years thereafter little birth control work was done because government agencies were paralyzed by the political struggle.

Up to this point, birth control efforts seem to have made little headway except perhaps in a few major cities. The rural areas were, for the most part, unaffected. The third birth control campaign began in 1968, but the initial stages were tentative and not very forceful. By about 1972, the efforts had been greatly intensified, and from that time onward a considerable decline in the national birth rate was reported. The reasons for the intensification of the campaign and for the strong commitment to the control of population growth that it signified were not made clear until after the fall of the "gang of four" in 1976. It is now acknowledged that the increase in food grain in China had not been keeping pace with the growth of the population and that employment was becoming an increasing problem for the cohorts of youth entering the labor force. Controlling population growth is now seen as of critical importance to China's program of modernization and to the prospects for improving living standards in rural and urban areas alike. The objectives for the future include popularizing the one-child family as an ideal for all of China and limiting the size of the population to less than 1.2 billion by the year 2000.

Very little information is available on the organization of birth planning activities at the national level in China. There is a Birth Planning Leading Group under the State Council, which is apparently the agency responsible for the implementation of policies relating to birth planning and for supervising and coordinating the work at provincial and lower levels, and in March 1981 a State Family Planning Commission was established with Vice-Premier Chen Muhua as minister in charge.

At the provincial level there are birth planning leading groups, whose function is to oversee the provincial staff offices for birth planning. Each staff office has its own supervisory and field staff which work in coordination with the provincial health departments. The latter provide technical support for birth planning work through their local facilities and personnel. The provincial staff offices are responsible for formulating policy, directing propaganda and education, maintaining contraceptive supplies, conducting research and evaluation of new contraceptives, and collecting statistics on planned births. There are twenty-nine units at the provincial level, consisting of twenty-one provinces, five autonomous regions, and three centrally administered municipalities.

At the county level, the planned birth staff offices di-

rect the local programs, with the guidance of the local planned birth leading groups. The staff offices coordinate the birth planning activities of the county health departments, the hospitals, and the mass organizations involved in family planning work. County medical facilities and personnel and the staffs of the local health clinics at the neighborhood level in urban areas and the commune and brigade levels in rural areas are also expected to provide support for birth control work.

Scholarly Activities. During the Hundred Flowers movement in the spring of 1957, a number of Chinese scholars, led by the demographer Chen Da, called for the establishment of special institutes for the scientific study of population and the training of research personnel, and many articles were written urging the government to take action to restore demography to the curriculum. Presumably the Chinese leadership were for a time receptive to the idea, but such hopes were speedily dashed by the "rectification" of the scholars in the summer of 1957. Until very recently, discussion of population theory was a "forbidden area."

With the downfall of the Gang of Four, there has been a marked change in the official attitude in China toward science in general and the social sciences in particular. The Population Research Institute at the Chinese People's University (CPU) in Beijing, which had been established in February 1974 under the leadership of Liu Zheng but had been hampered in its work by an unfavorable political climate, began to be much more active. In March 1978, at a forum on economic sciences in the Beijing area at which Xu Dixin, director of the Economic Research Institute of the Chinese Academy of Social Sciences, presided, the need to study population theory and statistics was recognized. In the fall of 1978, the CPU Population Research Institute sponsored a national symposium on population, with Vice-Premier Chen Muhua in attendance. In July 1979, a Society for the Study of Population Theory was established in Beijing and another at about the same time in Shanghai. Other local population associations were subsequently established in various provinces, and in December 1979 a second national population conference was held in Chengdu in Sichuan Province, at which a committee was set up to arrange for the establishment of a Chinese Population Association. The organization was founded in February 1981. In February 1980, the CPU Population Research Institute began publication of a quarterly journal of demography called *Population Research*. In April the Ministry of Education held a conference at which it announced its decision to establish demographic research and training at seventeen higher educational institutions throughout China, including six regional centers. The leading institution is to be the CPU Population Research

Institute, which is also one of the regional centers; the other five are at Fudan, Jilin, Zhongshan, Sichuan, and Lanzhou universities. The conference also formulated a research program for the period 1980–1983. In the same month, the Sociological Research Institute of the Chinese Academy of Social Sciences was reported to have been given the task of setting up a national population research center. In May 1980 the Family Planning Association of China was established, with Wang Shoudao, deputy head of the State Council's family planning leading group, as chairman.

These developments have been accompanied by an explosion of research, writing, and public debate on demographic subjects in China since 1978.

<div align="right">Katherine Ch'iu Lyle
John S. Aird</div>

See also ASIA.

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CIRCULATION

The term "circulation" refers to circuits of movement by individuals and small groups between points of origin and destination. It has been defined as "a great variety of movements, usually short-term, repetitive, or cyclic in nature, but all having in common the lack of any declared intention of a permanent or long-lasting change in residence" (Zelinsky, 1971, pp. 225–226). All such movements begin and ultimately terminate in the same place or community but, being studied from many disciplinary positions, are identified by a confusing variety of terms: return migration, circular migration, wage-labor migration, seasonal mobility, sojourner movements, transhumance, commuting.

For the people who circulate, the basic principle involved is a territorial division of obligations, activities, and goods. Throughout the Third World, these manifest two major influences. On the one hand is the security associated with the home or natal place through access to land for food, housing materials, and trading items; through kinship affiliation; through the care of children and the elderly; and through common values and beliefs. There are, on the other hand, the more widely spread opportunities and risks associated with political and religious leaders; kinsfolk; marriageable women and men; items for exchange or trade, ceremonials and feasts; and the introduced goods and services of wage-employment, commerce, medicine, education, religion, politics, and entertainment. The great variety of circulation resulting from such territorial disjunction (see Figure 1) has attracted the attention of social and behavioral scientists, who adopt in their research a range of philosophical positions, theoretical constructs, and analytic methods.
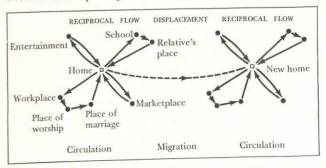
Historical Antecedents. During this century, three viewpoints recur. Circulation is regarded (1) as the integration of distinct places or circumstances, (2) as arising from socioeconomic disequilibrium, and (3) as the transfer of labor from one mode of economic production to another.

The concept of circulation as the integration of distinct places or circumstances originated in the early twentieth century with French scholars led by Vidal de la Blache

and human geographers. Among French geographers, circulation refers not only to the reciprocal flow of people but also of ideas, goods, services, and sociocultural influences. Wilbur Zelinsky (1971) incorporates this broader meaning, when charting the flux in population movement over long swings of time, and it is also implicit in the research of social anthropologists who acknowledge that individuals and small groups, once at their destination, continue to be linked with their origin communities by a cross-flow of remittances, investments, food, and visiting kin (Ross and Weisner, 1977). For most geographers and social demographers, however, circulation refers to the interchange of people between complementary places or situations, whether studied individually or at various levels of aggregation (Goldstein, 1978).

The idea of circulation as response to socioeconomic disequilibrium arises from anthropological research on wage laborers within the societies of southern Africa. Generally associated with the British school of functionalism, this perspective had its origins in the 1920s and 1930s but was crystallized in Godfrey Wilson's classic study of migrant workers in Broken Hill, Northern Rhodesia (now Kabwe, Zambia). "The social structure of Broken Hill today is characterized by the presence of a disproportionate number of young men and by a constant circulation of population between itself and the rural areas, between itself and the other towns of Northern Rhodesia, and between itself and other territories. The disproportion and the circulation are intimately connected . . . , they are phenomena of disequilibrium" (Wilson, 1941–1942, p. 36). This statement was amplified by the sociologist J. Clyde Mitchell, who termed the process "labor circulation" and explored the Rhodesian case to document the close link with urbanization and structural pluralism (Mitchell, 1969).

Economists and sociologists since 1970, notably those specializing in African and Latin American studies, are most associated with the view of circulation as the trans-

FIGURE 1. *Reciprocal flow and displacement of people*[1]

[1]Adapted from Cavalli-Sforza, 1963, and Roseman, 1971.

fer of labor between and within countries. Their approach, more macroscopic than the previous two, is especially concerned with the great transnational flows of labor. It often proceeds from the standpoint of dependency theory and is dominantly Marxian in its analyses of society and polity. To satisfy basic socioeconomic needs, the migrant worker is seen as prisoner of the world capitalist system and as therefore moving cyclically, and rather involuntarily, between domestic (precapitalist) and introduced (capitalist) modes of production (Amin, 1974; Burawoy, 1976). Although cut from a different philosophical cloth, antecedents of the concept exist in the idea of sojourner, especially as applied by historians and sociologists to the movement of Asian laborers to North America (Hune, 1977).

Until the late 1970s, these three approaches remained specific to different disciplines and existed without much reference to one another. Despite this, most circulation research shared a common focus upon Third World populations and especially upon peasant and tribal societies, whose members reside mainly in villages, rural market centers, or small towns.

Typologies and Data Bases. The many forms of circulation, and the related profusion of terms in the literature, have stimulated a concern with typologies of population movement. These efforts, being basically descriptive and anchored initially to the coordinates of time and space, were subsequently amplified to include the functional meaning of reciprocal flows and the perspectives of those involved.

For W. T. S. Gould and R. Mansell Prothero (1975), the fact that circulation does not alter the distribution of people distinguishes it from migration. To take tropical Africa as an example, the spatial dimension of recurrent flows can be differentiated into rural and urban environments, and the temporal into daily, periodic, seasonal, and long-term units (see Table 1). Sixteen kinds of circulation are identified and, when related to health hazards, reveal "different effects in the exposure of population to disease, in the transmission of disease, and in the development of programmes for the improvement of public health" (Prothero, 1977, pp. 264–265). Alternatively, the most ephemeral to the most permanent of voluntary moves may be arrayed along a continuum. Thus Graeme J. Hugo (1979), generalizing from Indonesian research on rural-urban mobility, suggests the varying degrees of commitment that individuals have to their villages of origin and to their city destinations (see Table 2).

Testing and refining such typologies, as with a detailed analysis of circulation, is made more difficult by the lack of pertinent information. Data from national censuses and large-scale surveys yield only cross-sectional snapshots of a behavior that is exceedingly sensitive to time. Intercensal comparisons based upon questions about

TABLE 1. *Typology of circulation in tropical Africa, with examples of associated activities and health hazards*

Space	Daily	Periodic (24 hours– 12 months)	Seasonal (one or more)	Long-term (12 months– several years)
Rural-rural	Cultivating Collecting (firewood, water) (1)	Hunting (1)	Pastoralism (1) (3)	Laboring (1) (3)
Rural-urban	Commuting (1)	Pilgrimage (1) (2) (3) (4)	Laboring (1)	Laboring (1) (2) (3) (4)
Urban-rural	Cultivating (1)	Trading (2)	Laboring (1)	Trading (2) (3)
Urban-urban	Intraurban commuting (3)	Pilgrimage (2) (4)	Trading (2)	Official/ commercial transfer (4)

Health hazards:

(1) exposure to diseases from movements through different ecological zones (e.g., malaria, trypanosomiasis, schistosomiasis, onchocerciasis).

(2) exposure to diseases from movements involving contacts between different groups of people (e.g., smallpox, poliomyelitis).

(3) physical stress (e.g., fatigue, undernutrition/malnutrition).

(4) psychological stress, problems of adjustment.

SOURCE: Prothero, 1977, p. 265; reprinted by permission.

TABLE 2. *Rural to urban population mobility in a Third World context*

Type of spontaneous mover	Characteristics of move	Commitment to city	Commitment to village
Short-term visitor	Adventitious shoppers, tourists, visitors.	None.	Total.
Seasonal or shuttle migrant	Search for work to augment meager agricultural incomes.	Very little financial or social investment in city. Sleep in open, group-rented room or employer-provided barracks. Social interaction almost entirely with other migrants from village. Employment in traditional or day-laboring sectors.	Family of procreation remains in village. Retain all political and social roles in village. Remit bulk of income (after living expenses) to village. Retain village citizenship. Almost total orientation to village.
Target migrant Short-term sojourner	Come to city for limited period (though longer than a season) to accomplish a specific purpose (e.g. reach a particular education level).	Moderate. May bring family of procreation. Seek more permanent accommodation, e.g., individually rented room. Have more interaction with settled urban population but retain close contact with fellow villagers in city. Usually employed in traditional sector.	Strong links maintained with family in village through visits and letters, although some roles may be temporarily given up. Remittances remain regular and high. Usually retain village citizenship.
Life cycle Stage migrant	Migrants who move to the city at one or more specific stages of their life cycle.		
Working-life migrant	Migrants who spend their entire working lives in the city but intend to, and eventually do, retire to their home village.	High. Family of procreation always accompanies. Purchases or builds individual housing, occupies employer (e.g., government) supplied housing or rents housing on long-term basis. Often in formal sector occupations. High level of interaction with settled urban population but retain contact with fellow migrants through associations, etc. Always transfers citizenship to city. Assists new arrivals to city from home village.	Sufficient links maintained with village to ensure acceptance on eventual return. Investments in housing and land although unable to maintain most social and political roles. Periodic remittances to family. Return visits made at end of fasting months and for important life-cycle ceremonies.
Permanent migrant	Migrants committed totally to exchanging a rural for an urban way of life.	Total.	None.
Undecided migrant	Migrants who have no clear intentions to either stay in the city or return to the village.	Unknown.	Unknown.

SOURCE: Hugo, 1978, p. 33; reprinted by permission.

place of birth and of residence identify long-term displacements of people but provide limited insights into the ongoing relationships within and between movement processes, population redistribution, and socioeconomic change.

Consequently, most evidence about Third World circulation derives from microstudies. Although prospective mobility registers have been used in village-based work in the Solomon Islands, central Java, and northwest Thailand (Chapman, 1975; Mantra, 1981; Singhanetra-Renard, 1981), the retrospective collection of movement histories has been more widespread. The common com-

plaint that such individualistic details are not susceptible to wider comparison has been addressed by French scholars, who developed a codified means to synthesize biographical data obtained mainly in North Africa and West Africa (Haeringer, 1972). The difficulties of recall, always present in the retrospective collection of mobility data, can be alleviated by the use of the life-history matrix. For this method, unstructured discussion about a person's lifetime proceeds according to changes in critical events (birth, marriage, education, occupation, land ownership), to which moves between various places might be related. Urban and rural research in Brazil,

Colombia, Mexico, and Thailand demonstrates that this technique requires a sensitive understanding of the people under study if it is to capture the details of mobility intertwined with other life events. Otherwise, a standard retrospective record will result: that is, a chronology of more permanent and long-distance movement without reference to its varied contexts (Lauro, 1979).

Circulation is more apparent from the demographic record in countries of French-speaking Africa, where there are multiround surveys and identical questionnaires are administered at regular intervals to the same population or in the same region. Some information also lurks within sequences of national censuses, but few demographers have plumbed this source. Sidney Goldstein and Alice Goldstein (1979), by contrast, have investigated rural-urban flows for Thailand by comparing place of birth with places of residence for 1965 and 1970. Despite the inevitable coarseness of the resultant matrix, repeat and return migration accounted for over a tenth of all migration and about one in four adults who returned to small towns and rural areas originated from cities.

Explanatory Models and Prognosis. Considerable effort has been devoted to the explanation of circulation, despite the sizable problems in documenting its magnitude and persistence. These efforts may be reduced to three, which to some extent parallel the antecedent themes noted previously: circulation as response to modernization; circulation within the context of social field and social network; and circulation as a result of the penetration of capitalism into peasant and tribal societies.

In the most ambitious statement, the hypothesis of the mobility transition, Zelinsky argues that "there are definite, patterned regularities in the growth of personal mobility through space-time during recent history, and these regularities comprise an essential component of the modernization process" (1971, pp. 221–222). A society or people consequently pass through four unilineal phases—premodern traditional, early transitional, late transitional, and advanced—during which there is "vigorous acceleration of circulation." This evolution in mobility assumes a repetition of the Western experience, which, even if it occurred, may not result from the forces of modernization. Thus, Hugo (1979) argues for colonialism as a far more powerful explanation of the west Javanese circulation while Richard Bedford (1973), in documenting a transition for wage-labor mobility in Vanuatu since 1850, concludes that it represents the dual participation in two socioeconomic systems: one traditional and the other introduced. In response to this and other Third World evidence, Zelinsky has declared that circulation is "symptomatic of the problems of underdevelopment" and consequently "promises to endure, with further vari-

ations and complexities, as long as underdevelopment persists" (1979; pp. 185, 187).

The idea of social network underpins thirty years' research in south-central Africa by Mitchell, who views labor circulation as a continuing dialectic in specified political and economic settings between the centrifugal attraction of wage employment and the centripetal power of village obligations, social relationships, and kinship ties (1959; forthcoming). In Melanesia, this formulation was expanded to include all reciprocal flows, irrespective of their purpose or duration (Chapman, 1976). Origin-destination links are so intense that social structures may become bilocal or multilocal, to the extent that G. K. Garbett (1975; p. 124) advances a decision model that specifies the "individual set in a network of social relationships." Mitchell's explanatory framework is ahistorical, however, and assumes that labor circulation will cease whenever a balance is struck between the two sets of centripetal and centrifugal influences. By contrast the study of East African towns by the economist Walter Elkan (1976), which spans two generations, establishes that longer periods of city residence need not be accompanied by the emergence of a permanent urban-based proletariat dependent entirely upon wage incomes.

Labor circulation is similarly the focus of more structural explanations, partly in reaction to the network model and partly out of a concern that too little attention had been paid to the political and economic processes within which the individual act of movement occurs. Penetration of capitalism into peasant and tribal societies so increases the local demand for cash that adult males have little option but to participate in a system of migrant labor, with the overall result that regional differences are intensified, village economies are impoverished by bearing the cost of rearing and training children who subsequently leave, and the stratification of rural society is either initiated or enhanced (van Binsbergen and Meilink, 1978). Very little field research articulates the details of this process but Jan Breman, who examined sugarcane cutters in southern Gujarat (1979), reveals how one company's desire for absolute control over and minimum commitment to its work force resulted in a preference for distant rather than nearby labor. Most structural explanations suffer, however, from the assumptions that Third World societies before colonial contact were socially and economically undifferentiated, indulged in no trade or exchange of labor, and did not subsequently filter the impact of capitalist forces according to the principles of indigenous production (Swindell, 1979). As with Zelinsky's mobility transition, most structural models emphasize the discontinuities rather than the continuities in circulation over time.

The greater sophistication of circulation studies during

the 1970s and the common ground slowly emerging from diverse philosophical positions may, let us hope, lead to much greater integration of different levels of inquiry and more careful attention to the various contexts within which mobility behavior occurs. Specific concerns are the persistence and change in reciprocal flows over generations, the contingencies between their diverse forms, and the ongoing links that people maintain between places of origin and destination. Often in Third World societies, traditional modes of circulation are manifest in contemporary behavior. Coexistent changes in socioeconomic condition, as of the growth of inexpensive transportation, permit villagers to commute to wage employment in towns and other local communities rather than to be absent for long periods. In other instances, the cross-flow of remittances, investments, and gifts substitutes for the physical transfer of people. Common sayings, local beliefs, and indigenous concepts can capture the essence of movement in ways not incorporated by Euro-American precepts and can also underline the ambiguities that elude schema based upon the discrete criteria of time and space.

To better comprehend complex reality, investigations and analyses must proceed at several levels: the microlevel (individual, family), mesolevel (community, settlement system, region), and macrolevel (country, continent, world). Such possibilities emphasize the critical importance of measurement and technique and of the need for both cross-sectional and longitudinal data. Greater attention must also focus upon circulation within rural areas and upon the social, economic, and political structures that bound and influence all manner of reciprocal flows, without necessarily accepting the assumptions made on these in Marxian analysis. The broader study of population movement already has benefited from Third World studies of circulation, a trend that is likely to continue.

Murray Chapman

For discussions of theories of migration determinants, see INTERNAL MIGRATION, *articles on* DETERMINANTS *and* MODELS.

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COMPOSITION

In the context of population, "composition" is defined as an aggregate description of the characteristics of individuals who constitute a group. Because individuals share such characteristics as age, sex, race, and ethnicity, the populations to which they belong are readily described in such terms. Additional characteristics used to describe a population's composition are educational attainment, economic status, occupational type, religion, marital status, and household or family membership. Some of these characteristics are biologically fixed, others are socially ascribed or personally achieved. Although rural-urban classification could be considered a characteristic of population members, in most instances residential differentials are treated more as distributional features than as compositional elements of a population.

The relative heterogeneity of a population is determined on the basis of dissimilarities that exist with regard to specified characteristics. While age-sex composition may be measured against such established distributional norms as the sex ratio at birth (105–106 males per 100 females), other compositional elements such as religion or ethnicity vary freely and are often used to describe a population's character. Cross-sectional or longitudinal comparisons are invaluable in identifying compositional elements that are associated with particular demographic patterns. For example, by comparing populations, educational or economic achievement may be related to demographic differences or changes.

Age-Sex Distribution: Population Pyramids. Composition measurements provide a snapshot of a population at a particular moment in time. This feature is graphically illustrated by the population pyramid, which depicts the age-sex distribution. It consists of two sets of horizontal bar graphs, one for each sex, which schematically represent the age distribution, usually in five-year groups. To facilitate comparison among the specified age groups and between the sexes, the bar graphs are juxtaposed along a vertical axis. By convention, male age distributions are placed on the left side of the axis, female on the right. The base of the pyramid is scaled to represent either total population numbers or the percentage of the total population that is represented by each bar.

The age-sex distribution is the cumulative result of interaction among three demographic variables: fertility, mortality, and migration. To the extent that mortality and migration have been selective by age or sex, they leave a record in the age-sex structure of surviving population members, one that is visible on the population pyramid. Similarly, because fertility levels are affected, among other things, by the proportion of women of reproductive age, the peculiarities of a given age composition may be echoed in successive birth cohorts. In this sense, the population pyramid provides not only a description of the present but also a window upon the demographic past.
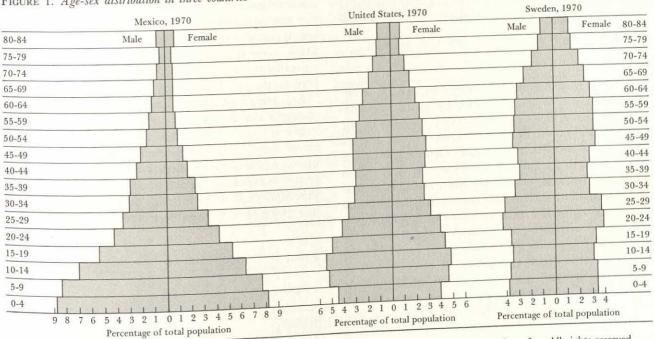
Since the probabilities of many demographic occurrences are a function of age, analysis of the age distribution occupies a primary position in demographic research procedures. The population pyramids presented in Figure 1 provide striking evidence of the variations in age distribution that can occur. The population of Sweden in 1970 had an age structure visibly older than that of the United States in 1970 and was in marked contrast to the very young population of Mexico in that year. Comparative analysis of the demographic rates that have prevailed in these three populations shows fertility differences to be the factor most responsible for these variations in age structure.

While people may move or die at any age, infants are by definition born at age zero, and so enter only at the base of the pyramid. Thus, fertility exercises the greatest effect on the age distribution. Populations experiencing high fertility will tend to be heavily weighted toward the youngest ages. This is particularly true when mortality among the young is low, relative to adults, and thus not counteractive to high fertility. As this typifies the demographic pattern prevailing in many developing countries, the broad-based pyramid shown for Mexico is a common one for them. The basic differences in age structure that characterize the developed and developing worlds may persist for some time.

Although the population age distribution may be most heavily influenced by fertility, longitudinal comparisons reveal that other demographic changes are not without their own effects. For example, the population pyramids presented in Figure 2 show that the population of Costa Rica became proportionally younger over the thirty-six year period from 1927 to 1963. Costa Rican fertility, though high, remained relatively constant throughout this period. Much more dramatic was the rapid decline in mortality, with the most striking reductions occurring among the youngest age groups. (Infant mortality declined from a high of 219 deaths per 1,000 live births in 1923–1927 to 74 deaths per 1,000 live births in 1963–1967.) Consequently, during this period the population became proportionally younger, more as a result of changes in mortality than in fertility. However, the smaller proportions of youth shown in the 1973 Costa Rica pyramid result from the dramatic fertility declines that have occurred since 1963.
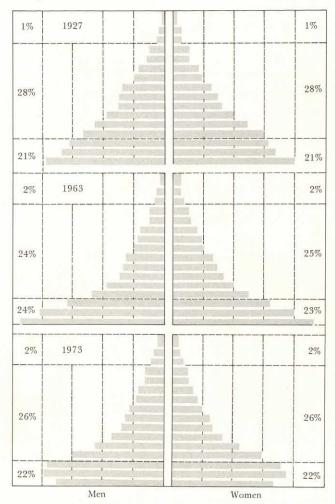
Migration can have similarly dramatic effects upon age and sex structure. In Figure 3 a time series of pyramids is presented for Hawaii. The heavy concentration of males in young-adult age groups is a pattern that predominates throughout this century. Male-dominant migration, originally from the Orient and later as a result of stationing U.S. military forces in the islands, explains many of these irregularities in the age-sex composition of Hawaii. With the passing of time, the sex ratios have become more balanced, but concentration of males in the young-adult ages remains.

FIGURE 1. *Age-sex distribution in three countries*

FIGURE 2. *Pyramids of the population of Costa Rica, 1927, 1963, 1973*

SOURCE: Fernandez et al., 1976, p. 56; reprinted by permission.

Age-Sex Distribution: Summary Measures. It is not always necessary or desirable to have such a detailed depiction of age and sex structure as that provided by the population pyramid. Summary measures of age and sex distributions are often more efficient and can be provided by the mean or median age and by sex ratios. It should be recognized, however, that summary measures such as these can mask structural differences that the population pyramid would make instantly apparent. Standard procedures for calculating means and medians are easily applied to population age data. The sex ratio has been standardized as simply the number of males per 100 females and, as noted, is normally 105 to 106 at birth. At higher ages it can of course take various values depending upon differences by sex in mortality or migration.

Another measure used to summarize age distributions is the dependency ratio. Sometimes referred to as the

"burden of dependency," this ratio is computed by relating the number of young and old in a population to those in an intermediate age range, regarded as the economically productive group that must support the others. Though the age divisions vary, the most common procedure is to compute the age dependency ratio as follows:

$$\text{Dependency ratio} = \frac{P_{0-14} + P_{65}}{P_{15-64}} \times 100.$$

The components of this measure may be calculated separately as child dependency and aged dependency ratios.

$$\text{Child dependency ratio} = \frac{P_{0-14}}{P_{15-64}} \times 100.$$

$$\text{Aged dependency ratio} = \frac{P_{65+}}{P_{15-64}} \times 100.$$

The three types of age dependency ratios are presented in Table 1 for the populations shown in Figure 1.
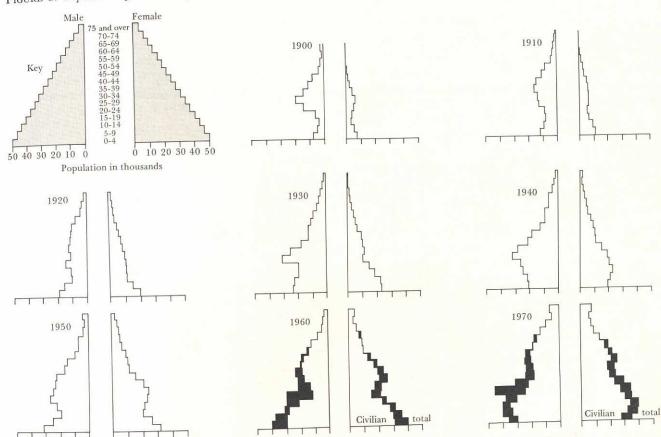
The dependency ratio is frequently used to provide a sense of a population's economic condition or potential. The ratio relates age groups that are presumably less productive economically to those that are more productive. A high dependency ratio, for example, may indicate that a population must devote considerably more economic effort to maintaining the less-productive age groups than a population exhibiting a low dependency ratio. Such interpretations should, however, be made with some caution. The age dependency ratio measures age composition only. A different measure, the economic dependency ratio, relates economically inactive to economically active groups and so provides direct information about economic composition. However, because the data required to compute the economic dependency ratio are often unavailable or unreliable, particularly for developing regions, the age dependency ratio is often used instead.

Economic and Social Composition. Measures of the economic composition of populations have played an important part in demographic analysis. The income levels of individuals or households serve to differentiate groups as one measure of economic status. A similar approach is to examine population composition in terms of the economic activities in which people engage. This may be accomplished by describing labor-force characteristics

TABLE 1. *Dependency ratios in three countries*

Population (1970)	Child dependency ratio	Aged dependency ratio
Sweden	31.2	19.4
United States	46.2	16.0
Mexico	93.2	7.5

FIGURE 3. *Population by sex and age, Hawaii, 1900–1970*

SOURCE: Gardner and Nordyke, 1974; reprinted by permission.

and, more specifically, by delineating the occupational distribution of the economically active persons.

Classifications commonly used to depict the labor-force and occupational characteristics of a population are shown in Table 2. The data are presented as time trends and are cross-classified by race. Comparisons between countries with respect to economic composition are particularly difficult because of the unavailability of definitional differences and data.

As with other compositional features, economic composition taken by itself can provide important indications of a population's character. Classification according to occupation and income may, for example, imply a great deal about social equality. Measures of economic composition can, of course, be further refined by cross-tabulation with other features such as age or sex.

Labor-force participation rates are calculated as the number of employed and unemployed in a population

TABLE 2. *Percentage distribution of employed persons, by occupation and race, 1960–1975*[1]

	White					Black and other				
Occupation	1960	1970	1973	1974	1975	1960	1970	1973	1974	1975
Total employed (thousands)	58,850	70,182	75,278	76,620	75,713	6,927	8,415	9,131	9,316	9,070
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
White-collar workers	46.6	50.8	49.9	50.6	51.7	16.1	27.9	31.1	32.0	34.2
Blue-collar workers	36.2	34.5	34.7	34.0	32.4	40.1	42.2	40.8	40.2	37.4
Service industries	9.9	10.7	11.7	11.8	12.3	31.7	26.0	25.3	25.1	25.8
Farmworkers	7.4	4.0	3.7	3.6	3.6	12.1	3.9	2.8	2.7	2.6

[1]Covers persons 16 years old and over. Annual figures are monthly averages, 1973–1975 not comparable with prior years because of reclassification of census occupation.
SOURCE: U.S. Bureau of the Census, 1976, p. 373.

per the total. Age restrictions are usually imposed to limit the calculation to persons old enough to be economically active. Time trends in labor-force participation and unemployment rates can illustrate changes that have occurred in economic composition. Additional information about concurrent changes in educational levels or family structure would provide the basis for examining the broader social changes implied by such transformations.

Literacy rates, calculated as the number of literate in a population per the total, provide the most basic means to measure educational composition. Given the increasing prevalence of modern school systems, it is also common to present educational data in greater detail, usually as percentage distributions in terms of school enrollment or highest grade completed. Educational status data are usually broken down by age and sex. As with other compositional elements, levels of educational achievement may be summarized by calculating median or mean years of school completed for the adult population.

The composition of families and households is an additional area of interest for demographic study. Most often presented are measures of family or household size, but when fundamental patterns of social organization are of interest, particular family or household types may be delineated as well. This is usually done by categorizing households or families by such characteristics as the age, sex, education, or income of the person designated as the family or household head.

Because marriage is the social mortar of families and households, a great deal of demographic attention is devoted to studying nuptiality. Information on the marital status of individuals by sex (single, married, widowed, divorced, or separated) is the usual procedure employed to describe this aspect of population composition. Caution must be exercised, however, as different societies vary greatly in the definitional precision of these categories. As marital behavior is strongly associated with sex and age, cross-tabulations almost always show age and sex differentials.

Presentation of such lifelong ascriptions as racial or ethnic identity is a more straightforward aspect of population composition. Because cultural or social differences often accompany racial or ethnic identification, analysis in these terms remains a feature of demographic study. Similarly, adherence to a particular religion may imply sufficient sociocultural cohesion to warrant differentiation on this basis.

The various elements of population composition—age-sex distributions; economic status; educational attainment; family and household type; race, ethnicity, and religion—are, most simply put, categories of characteristics that demographers use to describe populations.

When these compositional elements are cross-tabulated with each other they provide increasingly refined and detailed population descriptions. When specific compositional features are cross-tabulated with measures of demographic occurrence they provide a basis for explaining patterns of demographic behavior. In this way analysis of a population's composition is a key element in procedures of demographic research.

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See also AGING POPULATION; PROJECTIONS.

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CONTRACEPTION

Contraception is conscious action on the part of sexually active individuals or couples to prevent conception. The term refers to use of conventional barrier contraceptives such as diaphragms, cervical caps, condoms, foams, creams, vaginal suppositories, and so forth; use of traditional methods such as rhythm and withdrawal; use of hormonal contraceptives, including the pill and injectables; and use of intrauterine devices (IUD's). Male or female sterilization is considered a permanent form of

contraception. Abortion is considered a method of fertility control, but not of contraception, as it does not prevent conception. In this work, discussion of the modern methods of contraception can be found in the overview article under CONTRACEPTIVE METHODS; the article on ORAL CONTRACEPTIVES AND INTRAUTERINE DEVICES in the same entry discusses principally the risks and benefits of those methods. See also ABORTION, article on MEDICAL TECHNIQUES, and STERILIZATION TECHNIQUES.

Historically, many practices related to mores concerning appropriate timing of sexual intercourse have also served to prevent conception. These include practices related to acceptable age at marriage and age at first intercourse, taboos related to timing of sexual intercourse or abstinence from it within marriage, and practices regarding breastfeeding. For a discussion of some of these issues, see BREASTFEEDING and FERTILITY DETERMINANTS, article on PROXIMATE DETERMINANTS.

For information on the practice of contraception, see CONTRACEPTIVE USE and FAMILY PLANNING PROGRAMS. For information on the practice of abortion, see ABORTION, articles on INDUCED ABORTION and UNITED STATES.

In LAW AND FERTILITY REGULATION legal issues relating to the availability, distribution, and use of contraceptives are discussed. For a historical perspective on the promotion of contraception, see BIRTH CONTROL MOVEMENT.

CONCENTRATION

See DISTRIBUTION, *article on* DISTRIBUTION, CONCENTRATION, AND DISPERSION.

CONTRACEPTIVE METHODS

1.
OVERVIEW

Various contraceptive methods, some ancient and some modern, are currently available, and new methods under investigation promise important breakthroughs in safety, convenience, and reliability. This article describes currently available methods of contraception, recent advances in fertility regulation, and new areas for research.

Currently Available Methods. The methods of contraception currently in use are classified here by the ways in which they interrupt the reproductive process. Emphasis is placed on advantages, disadvantages, and recent efforts to reduce the disadvantages.

Coitus interruptus. The time-honored way to avoid a pregnancy has been for the male to withdraw prior to ejaculation. The method requires no supplies, expense, preparation, or assistance from physicians. On the other hand, it demands practice, male self-control, and considerable motivation. It may be reliable in highly motivated couples, but failures can result from the escape of semen before ejaculation, from semen deposited externally near the vagina, or from simple delay in withdrawal. Coitus interruptus has been so widely used for so long that it cannot be disregarded. There is hardly a language in which one cannot find a vernacular expression for "pulling out." Some demographers believe it to have been the major, if not the only, method responsible for the decline in birth rates in France in the eighteenth century, in England in the nineteenth century, and in other European countries.

Condoms. A cylindrical sheath that envelops the penis, a condom has the advantage of being cheap and simple to use and available without prescription from a physician. It has the disadvantages, however, of being distracting, of dulling sensation, and in some cultures, of being associated with prostitution because of its role as a prophylactic in venereal disease. If properly used and carefully manufactured, it is effective; but its actual failure rate can be high since users may sporadically discontinue use. In addition, rubber condoms deteriorate with time, particularly in sunlight and heat, and therefore have a limited shelf life, especially in tropical countries. There are now improved condoms, which are thinner, multicolored, and made of plastic. These have an unlimited shelf life and a more aesthetic appeal and are easy to manufacture.

Spermicides. Fluid substances of high viscosity containing spermicidal chemicals can also block spermatozoa from entering the cervical canal. They take a variety of forms; gels and creams introduced by means of a syringe-like applicator, suppositories inserted manually, aerosols that produce a dense carbon dioxide foam, and foaming tablets. Their advantage is that they require no prescription, examination, or fitting, are probably harmless, and can be used with little preparation. Disadvantages are leakage of fluid from the vagina, the need to wait while certain substances have a chance to melt, and poor effectiveness, usually owing to poor quality, inadequate quantity, or disregard for the required waiting period. At ejaculation, sperm are deposited right at or into the entrance to the cervix, so a spermicide substance must block the entry to be effective.

Postcoital douche. Retroactive douching with water or a spermicidal solution is the least effective of all methods because sperm have entered the cervix by the time the douche can be administered. Homemade concoctions, including such items as vinegar, bicarbonate of soda, and boric acid are used extensively, without evidence of effectiveness.

Diaphragms. Another means of obstructing the passage of sperm in the female reproductive tract is the diaphragm, a rubber device shaped like a broad, shallow cup, that covers the cervix. A diaphragm must be carefully fitted by an experienced person who can select the proper size, and the woman must be taught how to use it. It is nearly free from side effects or complications (infrequently a woman has a reaction to rubber), but the need to insert it carefully before each act of intercourse makes it undesirable for many women. When properly used with a spermicide, its failure rate may be as low as two to three pregnancies per 100 women per year. When used without a spermicide, the results are poor; a very high pregnancy rate can be expected.

Cervical caps. Like a diaphragm, a cervical cap obstructs passage of sperm into the uterus by blocking the cervix. A cervical cap is shaped like a thimble with a raised rim and is made of rubber, hard plastic, or metal. It must be fitted by an experienced person. A woman can learn to insert a cap herself, although it is more difficult to insert than a diaphragm. A cap is commonly used with a spermicide, especially when insertion and removal take place within several days. Spermicide may add little to the protection offered by a cap, however, when a cap is used for a longer period, for example from the end of one menstrual period to the beginning of another. In the latter situation a cap has the advantage of being free from association with the act of intercourse and is thus psychologically more acceptable to some women. A cervical cap may be useful for women who are anatomically or functionally unsuited to a diaphragm. It is contra-indicated in the presence of certain cervical pathology and extreme shortness or extreme elongation of the cervix. The pregnancy rate for users of caps seems roughly comparable to, or perhaps somewhat better than, the rate of the most successful users of diaphragm-plus-jelly and of condoms.

Sterilization. The advantage of sterilization is that a single procedure gives permanent security against conception, usually without further need for medical supervision and at a small cost of protection after the expenditure for the initial operation. The disadvantages are that trained surgeons and surgical equipment are needed, there are certain surgical risks, and the procedure is generally irreversible, though that characteristic is precisely what some see as an advantage.

Sterilization of the male (vasectomy) is usually under-taken to protect the wife from pregnancy, either for health reasons or because the desired family size has been achieved. The operation is a simple one, using local anesthesia, and does not require hospitalization. The spermatic duct, or vas deferens, is cut, and the two ends are closed by suture.

Since some men do not want to commit themselves irrevocably to infertility and others eventually change their minds and want their fertility restored, progress toward a reversible technique, termed reanastomosis of the vas deferens, is important. Depending on the skill of both the first and second surgeons, particularly with microsurgical techniques, the vas can be rejoined, and sperm will reappear. Subsequent pregnancy in the female, however, is less usual. It is possible that, following the original vasectomy, sperm cells are absorbed by white blood cells in large numbers, leading to the production by the body's immune system of antibodies, which enter the semen and cause clumping or agglutination of the sperm cells. As a result, they become nonfunctional. There is some evidence from animal studies that antibody disposition in the walls of blood vessels may lead to postvasectomy health problems. This topic is still being studied, although there is no report of similar findings in men.

A number of techniques are available for female sterilization (cutting the fallopian tubes). They involve either the abdominal or the vaginal route to the surgical field and different ways of tying different parts of the tubes. It is possible to restore normal fallopian tubes, with pregnancy following in about 50 percent of the cases, but it depends, as with the male, on the nature of the earlier operation and the skill of the subsequent operator. [*See* STERILIZATION TECHNIQUES.]

Rhythm. The rhythm method, or periodic abstinence timed to avoid coitus near the day of ovulation, was the first method to be based on a scientific understanding of ovulation, the development of the human egg, and the relation of ovulation to the menstrual cycle. In practice, the use of rhythm requires that a woman on a twenty-eight-day menstrual cycle abstain from intercourse from day ten through day seventeen. This period takes into account the variation in the day of ovulation, the fact that the egg is fertilizable for about twenty-four hours, and the fact that sperm are capable of fertilizing for about forty-eight hours. Although there are special problems with cycles of variable length, the time of ovulation can also be determined by taking the basal body temperature.

The rhythm method has the advantage of requiring no special equipment (except a calendar and a thermometer), costing nothing, producing no side effects, and being sanctioned by the Roman Catholic church. The disad-

vantages are the need for careful training, the likelihood of miscalculating the safe period, and the high motivation required. The commonest cause of failure is the occasional disregard of the rules.

Research is presently under way to improve the rhythm method, but results are not yet available. Three ways of determining the time of ovulation are being tested. (1) use of a small electrical device to measure the electrical charges that occur in the body when the egg is released; (2) the symptothermal method, whereby the woman keeps a daily record of her vaginal temperature and other signs of ovulation such as pain; and (3) the "ovulation" method, whereby the woman evaluates changes in the quantity and quality of her cervical mucus, which becomes abundant and clear at or near the time of ovulation. Overall, although the rhythm method is not the most effective method, it is a significant one in that it focuses on ovulation, the key event in the reproductive process. When it is used properly, and if long periods of abstinence are acceptable, it can be very effective indeed.

Pill. A greater understanding of endocrinology and physiology dramatically changed contraceptive practice when, in the 1950s, synthetic steroids were developed to serve as oral contraceptive agents. A conventional pill, a combination of estrogen with a progesterone-like chemical, works by suppressing the release of hormones FSH and LH. With no FSH and no LH, there is no ovulation. In addition, the synthetic steroids stimulate the endometrium and simulate a menstrual cycle. Usually, the schedule calls for taking pills for twenty-one days and then stopping for seven. The mechanism that makes this work is negative feedback: the brain recognizes the artificially elevated levels of steroids in the blood and therefore cuts down the production of its own hormones. Pills, if taken properly, can be virtually 100 percent effective.

Since the original pills were approved and marketed in 1960, major improvements have been made, primarily by using lower steroid doses. Some pills in use in 1981 contain less than 5 percent of the original amount of synthetic steroids. Low-dose progestins, in so-called mini-pills, have the advantage of eliminating the estrogens and their associated side effects, while allowing ovulation to continue. The actual effectiveness of this method is somewhat uncertain. The major side effect is considerable irregularity of the menstrual cycle. These pills offer hypothetical advantages regarding safety at the expense of effectiveness in preventing pregnancy. [*See* Contraceptive methods, *article on* oral contraceptives and intrauterine devices.]

IUD's. Intrauterine contraception began not with fundamental chemical and biological discoveries but with the empirical observation that the presence of a foreign body in the uterus prevents pregnancy. Intrauterine devices (IUD's) do not disrupt an established pregnancy; they prevent fertilization or implantation by rendering the uterus hostile to either the sperm or the fertilized egg, if there is one. Since, in general, the causes of implantation are not well understood, no more precise explanation can be given.

Although various intrauterine devices were used as early as the nineteenth century, they were not regarded favorably until the early 1960s, when new materials—such as plastics and stainless steel, which can remain in the uterus indefinitely—could be used.

The individual advantages of these devices are considerable: prolonged protection without the need for a regular regimen of pill taking, precoital preparation of traditional contraceptives, privacy, or high motivation. The advantages for a family planning program are that IUD's are simple to manufacture, inexpensive, can be inserted by trained paraprofessionals, and, particularly for the newer devices described below, can be inserted in women who have had no children (nulliparous women) and in women immediately following delivery (postpartum women).

New Methods. Recent research has led to the testing and use of several new methods of fertility control. Some are refinements of present methods; others, based on applications of fundamental research, are new.

Medicated IUD's. So-called pharmacologically active, or medicated, intrauterine devices have been developed to achieve maximum protection from pregnancy with minimal side affects. A T-shaped device had been shown to cause fewer complaints of pain, bleeding, and expulsion compared with a Lippes Loop, but these substantial advantages were canceled out by a higher pregnancy rate. To correct this, two antifertility agents that act locally on the uterus have been added to the plastic T: copper and progesterone. Several versions of copper-bearing devices have been tested, and two (a copper T and a copper 7) have been approved for use in a number of countries. Although at present these copper-carrying devices have a life span of about three years (a potential disadvantage in developing countries where it is difficult for women to return to a clinic regularly), a newer model of the copper T has a much longer life span. The progesterone-releasing device must be replaced every year. This disadvantage may be overcome by an IUD which releases the synthetic progestin leuonorgestrel. It can last for several years and provide a high level of effectiveness. Because they are small, these pharmacologically acting devices can be worn by women who have never been pregnant.

Postcoital estrogens. A synthetic estrogen, diethylstilbestrol (DES), if given for five days within seventy-two

hours of unprotected coitus, will prevent pregnancy. The action of the drug is thought to be on the corpus luteum and its role in providing progesterone in the very early stages of pregnancy. Because of its side effects (intense nausea and vomiting), a risk of disrupting subsequent ovarian cycles, and a long-term carcinogenic potential, the method cannot be used routinely. Despite the practical disadvantages, the principle is important. It is possible that other types of estrogens might accomplish the same purpose with fewer side effects, and a "morning-after" or "minutes-after" pill might be developed.

Methods under Investigation. Any new method that is going to be ready for use in the next three to five years has to be at a very advanced stage of testing now, including clinical trials with human subjects. Any project not yet in the clinical stage will take much longer to develop.

Vaccination against the pregnancy hormone. Researchers in several countries are working to develop a long-term, safe, and effective contraceptive vaccine. The focus of the work is human chorionic gonadotropin (hCG). This is the hormone secreted by the fertilized egg that signals the corpus luteum to continue producing the progesterone necessary for the continuation of the early pregnancy. The objective is to develop a vaccine that would influence the body's immune system to form antibodies to hCG, the pregnancy hormone. Such antibodies would then intercept the crucial message, should the egg indeed have been fertilized; the corpus luteum would regress; progesterone levels would decline; and menstruation, accompanied by the disappearance of the fertilized egg, would begin. Each cycle therefore would end with menstruation, whether or not fertilization had occurred.

A number of issues need to be studied before the vaccine can move beyond the preliminary testing stage. The pregnancy hormone, hCG, is similar in structure to a pituitary hormone (LH). The formation of antibodies that would cross-react with LH could be risky and could interfere with normal ovarian and menstrual cycles. An important resolution of this problem has been to use only one part of the hCG molecule, a part that is not fully shared by the LH molecule. This, however, contributes to a second problem: the part of the hCG used, the beta subunit, is quite small and is not a good antibody stimulant. To overcome this, the hCG beta molecule has been linked with the familiar tetanus toxoid, widely used by humans. Results to date in tests with volunteer subjects show that the vaccine causes the production of antibodies that neutralize the activity of hCG without interfering with ovarian and menstrual cycles. Clinical chemistry studies have not revealed any toxicity or abnormalities in liver and kidney function, but more work needs to be done on both the safety and reliability issues before the substantial promise of the method is realized. Similar work in the United States, the United Kingdom, and

Australia, using a fragment of the beta subunit of hCG, is still at the animal level.

Pharmacological suppression of the luteum. Also at the animal level are studies to identify a compound that would directly suppress the progesterone function of the corpus luteum, a process referred to as luteolysis. The principle is to eliminate the only source of progesterone that can prevent the expected menses in a fertile month. The action would probably be based on inhibiting a specific enzyme in progesterone production, but there are other possible mechanisms. If a proper compound could be identified, the high degree of specificity, affecting only the corpus luteum, would reduce the chances of side effects or complications beyond its intended effect: prevention of pregnancy. The only thing required of the woman would be to know that she was expecting a menses on a given day. On the three or four occasions a year when she is one or two days late, she could take a pill that would bring about menstruation. Others might prefer to use pills on a regular monthly basis, to induce menstruation without knowing if there were any question of being late. So far, the search for a purely luteolytic agent has turned up a few substances: an extract called Zoapatle from the Mexican plant *Montanoa tuberosa;* a synthetic nonsteroidal drug made in India named Centchroman; a few steroid inhibitors of progesterone synthesis; and a synthetic prostaglandin. Other approaches to luteolysis, described below, are at even earlier stages of fundamental investigation and must await more information about the control of progesterone synthesis and the role of cell receptors in the action of hormones.

Closely related to this field of research is work with a chemical substance extracted from an herb used in China to induce abortion. The root tubes of *Trichosanthis kirilowii maxim* are the source of the substance. The protein extracted is called trichosanthin. It is believed to be effective as an abortifacient through its cytotoxic effect on cells that produce chorionic gonadotropin.

Long-acting forms of contraceptive steroids. To overcome some of the disadvantages of pills, such as the need to remember to take them daily and the sudden absorption into the blood stream (and directly to the liver) of the synthetic sex hormones, better forms of steroidal contraception are sought. Ease of administration, the medical preference for constant dosage levels in the system, and the acceptability of injections by women who are accustomed to them for disease control are factors influencing this research. The attempts to find an effective and long-acting steroid take the forms listed below. Most are based on the same principle as pills.

Injections of progestins, given at lengthy intervals, are being tested clinically. The injection of Depo-Provera every three months is widely used for contraception throughout the world, but its use is not approved by the

United States Food and Drug Administration. The synthetic progestin that is the active ingredient of Depo-Provera has not performed well in long-term toxicity studies in beagle dogs. This fact, plus clinical experience suggesting a posttreatment loss of fertility, contributed to a cautious interpretation by the U.S. regulatory agency of the compound's risk-benefit ratio. The concern over safety has been reinforced by recent findings in rhesus monkeys. On the other hand, in South America, the Caribbean islands, and many Asian and African countries, Depo-Provera is used regularly as an injectable contraceptive in spite of the safety issues and its serious disruption of menstrual bleeding patterns. Scientists are studying another injectable progestin, called "norethisterone enanthate." It is a close chemical relative of the progestin in one of the most popular contraceptive pills.

Implants have been tested as a method that could avoid the need for return visits to a clinic and assure the constant and gradual release of steroids. These are tubes or rods made of a rubberlike compound containing synthetic steroids, which are implanted, with a small incision, under the skin, usually in the arm or the buttocks. One implant regimen that would last for one or two years uses a new progestin, "norgestrienone"; another uses "levonorgestrel," a popular drug when used in pill form, and could last for as long as six years. Also being tested, but at a much earlier stage of research, are biodegradable substances like those used in absorbable surgical sutures. The advantage of this development is that the implants would not need to be removed but would simply disintegrate under the skin as they progress through their effective lifetime. The six-year implant of levonorgestrel is highly effective in terms of pregnancy prevention. Its main problem is bleeding irregularity, a side effect that makes the method unacceptable for about 18 percent of those who use it. Field studies of this particular form of the implant method, begun in 1980, may lead to wider distribution by 1982.

Steroids can be absorbed through the vaginal mucosa. Taking advantage of this property, researchers have incorporated progestins into a plastic ring, similar to but smaller than the rim of a diaphragm, which is introduced into the vagina behind the cervix. The woman can insert a *vaginal ring* herself and leave it in place for three weeks before removing it, thus precipitating a menstrual flow. The schedule of three weeks in and one week out is similar to the contraceptive pill regimen. The advantage is that the user does not have to remember to take a pill every day. The steroids are released at a more constant level, a feature that may avoid significant side effects of pills. A ring needs to be replaced with a new one about once every six months when the steroids are exhausted. This method shows clinical promise, but further consideration is being given to the effects on lipoproteins.

Unlike IUD's, which are placed in the uterus, or vaginal rings, which are placed in the vagina, other devices can be placed in the cervix. The purpose is to accomplish local contraception without affecting the rest of the body. An *intracervical device* would release sufficient progestin to cause thickening of the cervical mucus.

Pharmacologic contraception for males. Although for centuries contraception was left up to males, who used coitus interruptus and condoms, attention to chemical methods for men began in earnest with clinical trials only in 1971. A difficulty encountered in the field of contraceptive research in the male is the small number of links in the reproductive chain of events, compared to the number of vulnerable points identified in the female system. The focus has been on suppressing the production of sperm through the action of synthetic male hormones in a manner analogous to the suppression of egg production and ovulation in the female with pills. The problem, as with pills, is to achieve a balance between dosages of steroids that would stop sperm production on the one hand and not cause unacceptable side effects, on the other.

Combinations of the male sex hormone, testosterone, and progestin have been used to stop sperm production. Their effect is reversible, and they do not introduce unacceptable hazards. The main problem with the compounds at dosages tested is inability to maintain low sperm counts for a protracted period. In too many cases, sperm production breaks through after a few weeks or months. The problem appears to be proper compound identification and establishment of proper dose. A male contraceptive, like the female contraceptives still under investigation, could take the form of a pill, an implant, or an injection. A report from China describes successful clinical trials in men with a compound extracted from cottonseed oil. The studies were undertaken on the basis of reports of a high incidence of male infertility in regions where raw cottonseed oil is used widely in the diet. A known toxic substance, gossypol, was extracted from the cottonseed oil and tested in animals. It was found to suppress sperm production and was subsequently introduced into clinical trials. The cumulative toxicity of gossypol in certain animal species is a cause for concern with this drug, even though the Chinese studies are being carried out with low doses of the substance. The nearly complete effectiveness described in the published report is an encouraging finding. However, the toxicological potential of gossypol makes the establishment of an acceptable pharmacological ratio (toxic dose: effective dose) a critical issue.

New Areas of Research. Many new areas of research have come about through major breakthroughs in methodology, such as the development of very sensitive assays, or tests, to measure tiny quantities of hormones in the blood and other body tissues. It is now possible, using just

a finger-prick sample of blood, to test for the presence of hormones that could not be tested with any degree of accuracy before. Another significant methodological advance is amino acid sequencing, the ability to determine the amino acid structure of any protein. The application of this technique by protein chemists preceded the isolation and use of the beta subunit of the pregnancy hormone, hCG, in the antipregnancy vaccine described earlier. The prospect of such a vaccine was postulated in the 1940s, but the development had to await the methodology to isolate and identify the pure hCG molecule. Polypeptide synthesis, another major methodological discovery that has contributed to human reproductive research in the last five years, is the process of making a synthetic protein, once its structure is known. It is now possible through this technique to make artificial molecules that are identical to the ones in the body and that can be used as substitutes. Another advance, the electron microscope, has permitted study of the egg and sperm at the subcell level.

These fundamental methodological advances and other discoveries in protein chemistry, neuroendocrinology, and molecular biology have great potential for a future generation of contraceptives. Discussed in the following material are fundamental areas of laboratory research that may have future payoff for fertility control.

Influencing the brain. The protein produced in the brain that triggers the production and release by the pituitary of the hormones that stimulate the ovary and the testis is the luteinizing hormone releasing factor, LRF. It is now possible to isolate and synthesize LRF, a decapeptide, or a chain of ten amino acids, and make similar or antagonistic compounds. One possible application would be an antagonist to suppress ovulation. A second application would be to stimulate ovulation on a predictable basis, administering the synthetic protein as a pill, a tablet absorbed under the tongue, a nasal spray, or a vaginal tampon. The message would reach the brain; LRF would cause the production of LH, and ovulation would occur at a precise time, allowing a woman to use the rhythm method with greater certainty. Since such a method would affect only the cells in the pituitary that produce LH, it would avoid the more general side effects of less-specific compounds, such as the steroid pill. In the male, analogues of LRF could be used to prevent sperm production.

Another point of action between the brain and the reproductive system that may be useful for intervention is the pineal gland, which produces a biologically active chemical called melatonin. In lower mammals, melatonin inhibits ovulation. What it does in the human is not known, but it may be related to pineal control of the function of the ovary. From work in this area, a pill or some other method may be developed to inhibit the ovary, again without having an effect on the rest of the system and therefore without producing the risks of a steroid pill.

Occupying the binding sites. The gonadotropins that bind to special cells on the surface of the ovary and stimulate the ovary to function are large strings of amino acids with sugar molecules called "glycoproteins" attached to them. Without these special carbohydrates, the proteins bind onto their special target cells but move off so quickly that they will not do what they are supposed to. This suggests that counterfeit molecules could be synthesized. These altered molecules could occupy the binding cells in place of the real ones and therefore block their action. With hCG competitors, this first-come-first-bind process might lead to a chemical abortifacient. If a woman has missed a period, she could take an antagonist. A fake message would arrive at the ovary and, in effect, fail to tell the corpus luteum to continue to deliver progesterone. By keeping real hCG off the binding sites, the new drug would induce menses.

Identifying the receptors. Work is going on to learn more about the chemistry of the receptors, or binding sites, on the surface of cells of the ovary or testis for the gonad-stimulating hormones in both the male (testis) and the female (ovary). Altering the binding capacity of these cells might also inhibit gonad function.

Understanding the intracellular action of steroids. A very important field is the biology of steroid hormones at the level of single cells. Research has shown that many cells in the reproductive system tell their own internal factories what to produce according to a complex chain of messages starting with the entry into the cell of the steroid hormones. The hormone attaches to receptors in the cytoplasm of the cell, which carry it into the nucleus. There interaction with the chromosomes determines the pattern of which genes are active and which genes are not. The message is given to add amino acids in the right sequence to make the right protein. Implications of this new knowledge for contraception are that it might be possible to allow the ovarian cycle to continue normally, but then interfere with the action of the steroids on the cells of the endometrium so that the uterus does not have the right secretions to prepare properly for pregnancy. Different impact points in the normal steroid-receptor interaction are possible: the formation of the receptors in the cytoplasm; the rate of degeneration of the receptors; the binding process of the steroid to the receptor; and the binding of the steroid-receptor complex to the chromosomes. Chemical substances have been synthesized to block some of these actions, at least in laboratory experiments. It is a giant step to clinical application, but it is not an improbable development.

Affecting the membranes of egg or sperm. When the first sperm touches the egg in the fallopian tube, changes in the membrane of the egg block the entry of more sperm. This block to polyspermy is what keeps the egg alive; if it were penetrated by more than one sperm, it would never develop or survive and would be sloughed off in menstruation. Research on marine invertebrates, such as the sea urchin, suggests that the first sperm chemically alters the egg membrane so that the remaining sperm receptors on its surface are inactivated. Therefore one approach would be to develop a surrogate sperm that would beat the real sperm to the egg, induce this change in the egg membrane, and block the penetration of the real sperm. Another possibility would be to change chemically, with a pill or an implant, the egg membrane from its prefertilization delicacy to a tough skin. An additional route would be to encourage polyspermy and the subsequent passing of the nonviable egg with menses. A great deal more about fundamental membrane biology must be known before this line of research can be pursued.

Interfering with sperm and egg development. In a process that is not very well understood, sperm mature between leaving the testis and entering the fallopian tube of the female. Important changes occur during the journey through the male epididymis, including alterations in structure, metabolism, pattern of motility, and fertilizing capacity. Once more is learned about the biochemical nature of this process, the epididymis may serve as a site for interrupting capacitation so that the male ejaculation contains "blanks."

In the human female, the eggs are in a state of arrest for a number of years, a condition apparently caused by a maturation inhibitor produced by the follicles. It has been shown with marine organisms like the starfish that when certain follicular maturation factors are applied to the ovary, the eggs in the ovary will start to develop. Work is under way to determine whether a natural or chemical agent can be used to inhibit or stimulate egg maturation in the follicles of mammalian ovaries, a development that would have the greatest usefulness in fertility control application, because of its specificity to the reproductive process.

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See also ABORTION, *article on* MEDICAL TECHNIQUES; CONTRACEPTIVE USE; FAMILY PLANNING PROGRAMS; STERILIZATION TECHNIQUES.

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2.

ORAL CONTRACEPTIVES AND INTRAUTERINE DEVICES

By the early 1980s, many millions of women throughout the world had used the pill and the IUD at one time or another, with as many as 60 million women estimated to be using the pill and 15 million the IUD on a regular basis. The rapid acceptance and use of the pill as well as IUD's is probably unprecedented in medical history, and apparently is a result of the desire among couples to have methods of contraception not related to coitus.

Initial enthusiasm for these methods, however, has been tempered by increasing reports of complications of both short-term and long-term use. This article will attempt to summarize and put into perspective the various risks and benefits facing women considering a modern method of contraception. [*For information on the history and mechanism of action of these methods, see* CONTRACEPTIVE METHODS, *overview article.*]

The Pill. Oral contraceptives (or, as they more commonly are called, "the pill") were introduced to clinical use in 1960. The most commonly used pill contains small amounts of estrogen and progesterone and acts mainly by inhibiting ovulation. Because of the widespread use of the pill for preventive purposes, with the attendant major systemic effects and complications, it has been the subject of a great deal of controversy in both medical and lay publications. The following section will attempt to compare the benefits and the risks of this method of contraception.

Benefits. Perhaps the benefit of greatest single importance has been the separation of contraception from the coital act. The theoretical effectiveness of the pill is extraordinarily high, with a failure rate of only 0.1 per 100 woman-years of use. Unfortunately, many women do not always remember to take the pill, and the actual failure rate is between 2 to 4 per 100. For those women who do

take the pill regularly and on schedule, its efficacy is a significant benefit. Although some women complain of intermenstrual spotting, the pill has a salutary effect on menstruation in most users. Menstrual periods usually become lighter and of shorter duration. Women who normally suffer from pain during menstruation (dysmenorrhea) usually find relief while taking the pill.

A protective effect of pill use against several conditions, including benign breast tumors, benign ovarian cysts, rheumatoid arthritis, arthritis, anemia, and pelvic inflammatory disease, has been suggested. In the early 1980s case-control data were presented to suggest a negative relationship between pill use and the development of ovarian and endometrial cancer. These were preliminary reports and additional studies will undoubtedly be conducted. Even more preliminary data also have suggested a protective effect against breast cancer. If the pill is indeed identified as a protective agent against cancers of these organ systems, this would be a significant additional advantage of its use.

Minor side effects. Among women regularly using the pill, a large number of minor side effects are noted. These include nausea, weight gain, mild headaches, vaginal spotting between periods, decreased menstrual flow, occasional missed periods, depression, mood changes, acne, and chloasma (darkening of the skin of the upper lip, under the eyes, or around the forehead). Although these side effects have caused some women to discontinue use of the pill, among the majority of women such complaints are sufficiently minor as to not interfere with continued contraceptive practice.

Major complications. Primarily through case-control (or retrospective) epidemiological studies, a number of probable but rare complications of oral contraceptive use have been identified. Major case-control studies have been conducted both in Great Britain and the United States, and most of the data leading to the conclusions described herein come from those studies. Such studies identify probable relationships; they do not establish cause and effect with certainty. Since the late 1960s, large prospective or cohort epidemiologic studies have been undertaken—two in Great Britain and one in the United States. These are studies of large numbers of women who are followed over time to attempt prospectively to identify complications associated with pill use. By and large these studies are beginning to substantiate the relationships demonstrated in the earlier case-control studies. The decade of the 1980s should see a significant increase in the understanding and documentation of both complications and benefits.

The most carefully documented relationships have related to the cardiovascular (or blood vessel) system. In the late 1960s, a relationship between pill use and throm-boembolic (bloodclot) disease was noted. These early studies identified a fourfold to eightfold excess of pill users among women who died of thromboembolic disease, particulary pulmonary (lung) embolism and stroke. In lay terms, there appears to be an increased incidence of the formation of bloodclots in veins of the legs or in the pelvis, with pieces of these clots sometimes breaking off, traveling through the veins, and reaching the lungs (causing pulmonary embolism) or the brain (causing stroke). Either of these two conditions can result in a death.

A relationship was also identified between pill use and myocardial infarction (heart attack). For all of these cardiovascular conditions, other factors also were shown to be of importance. The most important is the smoking of fifteen or more cigarettes per day, particularly in women over age 35. The risk of a cardiovascular complication is significantly greater among women who both smoke and use the pill; they are advised to discontinue at least one of the two practices. There is some evidence to suggest that the significantly lower dosages of estrogen and progesterone in pills currently in use, as compared to earlier pills, may assist in lowering the cardiovascular risks.

A relationship appears to exist between the use of the pill and a small increase in blood pressure, which in most cases appears to be mild in degree and almost always reversible. Similarly, a possible relationship has been demonstrated between pill use and the development of gallbladder disease, although recent data have questioned the validity of this relationship. In the mid-1970s, reports began to be published suggesting a relationship between the use of pills and the development of a rare, benign, but potentially dangerous tumor of the liver, called hepatocellular adenoma. A small number of the published cases have proven fatal secondary to sudden rupture and bleeding. Because this condition remains an extremely rare complication, it has not yet been possible to establish a specific rate of incidence. The tumor appears to resolve after cessation of pill use.

Questions have been raised about a possible relationship between the use of the pill (and other hormonal preparations) and the development of congenital abnormalities among women who continue to take the pill while pregnant. These data, as of 1982, remained equivocal and required further observation.

Despite earlier concerns, a relationship between pill use and infertility has been shown to be a very rare complication. As with IUD use and use of other contraceptives, well over 90 percent of the women who discontinue pill use to become pregnant are successful.

In the early 1970s a possible relationship was suggested between the use of the pill and the development of a

precursor of cancer of the cervix. The initial report, however, could not be substantiated by others, and later reports by the same authors suggested no such relationship. Most subsequent reports on the relationship between pill use and cervical cancer have shown no difference between pill users and control patients. The assessment, however, has been made more complex because of other factors which are difficult to control for in epidemiological studies. These include age of onset of sexual activity and number of sexual partners, factors which are known to influence the development of cervical malignancy.

Contra-indications. Absolute contra-indications to pill use include a history of thromboembolic or other cardiovascular disease, impaired liver function, a history of jaundice of pregnancy, malignancies of the breast or reproductive system, and pregnancy. Relative contra-indications to use include migraine headaches, hypertension, diabetes, gallbladder disease, and sickle cell disease.

Intrauterine Devices. A large number of different intrauterine devices (IUD's) have been developed, varying in size, shape, and material, and often satisfying one requirement at the expense of another. Small size, for example, tends to reduce the common side effects of bleeding and pain but increases the expulsion and pregnancy rates. Rigidity can decrease expulsion, but it increases bleeding and pain, as does increasing size. There are a variety of shapes including coils, loops, rings, shields, and T-shaped devices. Nurses and other personnel have been trained to insert these devices, thus obviating the need for a physician, an advantage of particular importance in developing countries.

Of the many IUD's developed, most fall into two categories, the original plastic and metal devices, such as the Lippes Loop, and the newer so-called medicated devices which include 7-shaped or T-shaped IUD's containing either copper or progesterone. These latter devices are somewhat easier to insert, produce less pain at the time of insertion, and cause somewhat less bleeding. In addition, they are more appropriate for women who have not had children than are the other devices presently available. The most widely used device at the present time is the Lippes Loop followed by the newer copper-bearing devices. No significant differences exist among these various devices in terms of complications, expulsion, and pregnancy, although the World Health Organization, based on their assessment of a large collaborative study, has suggested that the copper-bearing devices may be somewhat more effective than the Lippes Loop. Their recommendation in this regard may, in time, result in the copper devices becoming the most widely used ones.

Benefits. The devices are highly reliable, but not completely so, with pregnancy rates of 1 to 2 per 100 women per year. The benefits of IUD's include their high effec-

tiveness, dependable retention, ease of insertion and removal, reversibility, nonassociation with coitus, and freedom from continuous medication. Thus, once an IUD has been inserted, there is nothing else the woman has to do but to periodically check that the IUD string is still in place. For many women this makes the IUD an ideal method, despite some of the side effects.

Minor side effects. As compared to the pill, there are only a few minor side effects noted among IUD users. These can, however, be so bothersome in some women as to result in IUD removal. The two major complaints are pain or cramping, usually at the time of the menstrual periods, and bleeding. The latter complaint takes several forms, including spotting or staining between periods, heavy and prolonged bleeding during periods, or both. These complaints, when present, generally are worse during the first two or three menstrual cycles after insertion and decrease thereafter. Another common complaint is an increase in vaginal discharge. Finally, in some women, the uterus will expel the IUD.

Major complications. A major concern has been the possibility of introducing infection into the uterus. Although studies in the early 1960s suggested that bacteria were introduced into the uterus at the time of insertion, the uterus generally was found to be free of bacteria within the first few days of use. Increasing numbers of case-control studies, however, have suggested a relationship between the use of IUD's and an increase in the incidence of pelvic inflammatory disease (PID). Many of these cases are asymptomatic, but occasionally severe infection ensues, requiring hospitalization. There also have been reports of a possible increase in the incidence of ectopic (or fallopian tube) pregnancies. At the present time, however, it is felt that the incidence of such pregnancies has not increased with the use of IUD's; rather, it simply appears so because these devices protect better against intrauterine pregnancies than against pregnancies that might establish themselves in the tubes.

Because of the possibility of infection in the tubes, with the potential of producing scarring and resultant infertility, many physicians are reluctant to use the IUD in women who have not yet had a baby. This is particularly so for sexually active teenagers who already are at higher risk than the general population of developing a venereal disease with pelvic infection. Although use of an IUD in women without children remains a subject for debate, most family planning clinics will use IUD's in those cases when other methods cannot be used. Data on this issue continue to be collected.

In the mid-1970s several deaths were reported in women who had become pregnant with an IUD in place and aborted during the second trimester of pregnancy. These deaths appeared to be related primarily to a device

called the Dalkon Shield, which has since been removed from the market. Women now are commonly advised to have an IUD removed if they become pregnant with one in place. Since 1975 there have been no further reports of death resulting from this problem.

Contra-indications. Contra-indications to IUD use include acute or recurring infection in the tubes (pelvic inflammatory disease), vaginal bleeding of unknown etiology, genital cancer, congenital abnormalities of the uterus, and, of course, pregnancy. There are other conditions, including a history of venereal disease, severe anemia, and congenital heart disease, which fall into a category of relative contra-indication requiring consultation with a specialist.

Risks and Benefits. Although both the pill and IUD's have a reasonably documented risk of morbidity and mortality, it is essential to review these risks in the context of other contraceptive alternatives and of the benefits they offer. Through computer model calculations using current data related to pregnancy and contraceptive use, Table 1 was prepared showing the annual numbers of deaths associated with control of fertility per 100,000 fertile women. As can be seen, with the exception of women over the age of 35 who are heavy smokers, this indicates that both pill and IUD use result in far fewer deaths than the use of no contraception (that is, complications of pregnancy lead to higher death rates than does the use of either of these modern contraceptive methods). For the woman who wishes the safest alternative, the table suggests her choice should be to use traditional methods (condoms, foam, diaphragms, or rhythm) together with early first-trimester abortion for method-related failures.

Table 2 attempts to put this conclusion in perspective; it compares mortality rates from a variety of causes per 100,000 women, age 20 to 44, in England and Wales.

TABLE 2. *Mortality rates from various causes per 100,000 women aged 20–44, England and Wales, 1973*

Cause of death	Age group	
	20–34	35–44
Breast cancer	2.6	25.3
Cervical cancer	0.9	4.9
Kidney disease	0.8	2.0
Multiple sclerosis	0.5	1.4
Homicide	1.2	1.0
Suicide	4.4	7.7
Traffic accidents	5.9	4.6
Pregnancy	14.6	57.7[a]
Legal abortion	1.3	1.8
Pill-nonsmoker	1.4	3.6
Pill-smoker	5.2	35.6[b]
IUD	0.9	1.4

[a] Aged 35 to 39, 44.0; 40 to 44, 71.4.
[b] Aged 35 to 39, 12.8; 40 to 44, 58.4.
Source of data: Vessey and Doll, 1976.

Again, with the exception of women who use the pill and are heavy smokers, rates of death due to use of the pill or IUD's are significantly lower than the mortality associated with suicides, traffic accidents, and a number of medical conditions. It thus appears consistent with good medical practice to continue the use of both the pill and IUD's, although it is also clear that further research, especially the continuation of prospective and case-control studies, is in order.

Most data currently available relate to findings in the developed world, primarily in Great Britain and the United States. While the pill is widely used in developing countries, data on possible complications are not readily available there, as a result, in large part, of the difficulties of obtaining such data in rural, less well developed societies. However, the known risks of pregnancy are far higher there, so that when the potential risks of the pill and IUD's are assessed in relation to the very high maternal mortality rates that prevail in those settings, the relative health benefits of contraception appear to be even greater than in the West. In addition, there is some evidence that the risks of thromboembolism and other cardiovascular diseases are less in developing areas, probably as a result of differences in diet, smoking habits, and life style.

Given the strikingly high maternal and infant morbidity and mortality rates in these countries, many have concluded that the benefits of the pill and IUD's heavily outweigh the possible risks. Moreover, given the extreme shortages of physicians in most rural areas of the developing world, many countries have decided to allow paramedical personnel and indigenous lay personnel to prescribe the pill, both in clinics and in villages. Similarly, the training and use of various categories of paramedical

TABLE 1. *Annual number of deaths associated with control of fertility per 100,000 nonsterile women by method and age*

Method of contraception	Age group			
	15–29	30–34	35–39	40–44
None	6.4	13.9	20.8	22.6
Abortion only	1.5	1.7	1.9	1.2
Pill:				
Nonsmokers[1]	1.4	2.2	4.5	7.1
Smokers[1]	1.6	10.8	13.4	58.9
IUD[1]	1.0	1.4	2.0	1.9
Traditional methods	1.5	3.6	5.0	4.2
Traditional methods plus abortion	0.2	0.3	0.3	0.2

[1] Includes 0.2 to 0.6 birth-related deaths from method failure.
Source of data: Tietze, 1977.

personnel to insert intrauterine devices has been shown to be safe in both developed and developing societies.

Allan Rosenfield

See also CONTRACEPTIVE USE; FAMILY PLANNING PROGRAMS.

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CONTRACEPTIVE USE

1. DEVELOPING COUNTRIES   Dorothy L. Nortman
2. UNITED STATES OVERVIEW   Barbara D. Levine
3. UNITED STATES SINCE 1970   Kathleen Ford

1.

DEVELOPING COUNTRIES

The prevalence of contraceptive use is determined by measuring the proportion of a population practicing contraception at some defined point in time. Since contraception has demographic meaning only in relation to people of reproductive age, the denominator of the prevalence rate is the number of women of reproductive age or some subgroup thereof. The numerator is the subset of the denominator currently using a method to avoid conception.

Measuring Contraceptive Prevalence. While these concepts of measurement are clear enough, the empirical measurement of prevalence is beset with problems, the resolution of which affects the comparability of survey findings. The numerator is affected by the mix of methods incorporated into the definition of contraceptive practice. Inclusion of methods of dubious value, the use of precoital or postcoital herbs, for example, will increase the prevalence rate, as will inclusion of sterilization performed primarily for health reasons. On the other hand, to conform to laws that allow sterilization for health but not for contraception, sterilization as a contraceptive method may be underreported in the numerator. Moreover, menstrual regulation and induced abortion cannot be ignored. As these are postconception rather than preconception methods, it is logical to exclude them from the count of couples practicing contraception, yet their exclusion can produce a prevalence estimate that has a serious downward bias with respect to the degree of fertility control in the population.

Abstinence is another method that invites ambiguity. Respondents are generally asked whether they used any method or methods to avoid pregnancy in the last week or month. If the answer is yes, the methods are usually specified. On the other hand, if the answer is no, it is not clear without further probing whether (1) the couple abstained, and if so, for contraceptive or noncontraceptive reasons, or (2) the couple engaged in intercourse without contraceptives. It can be argued that couples who abstain for noncontraceptive reasons should be removed from both numerator and denominator of prevalence rates that refer to a married population, but whether this refinement is of consequence in the prevalence rate has rarely, if ever, been considered.

Denominators of prevalence rates vary greatly with respect to age composition and marital status. The former is generally taken as 15–44 or 15–49, but 20–44 or 20–39 are not infrequently encountered, even among populations with a sizable proportion of births occurring to women under age 20. Both numerator and denominator of a particular prevalence figure should relate to the same age span.

With respect to marital status, the class of women considered in prevalence rates ranges from all women of reproductive age, to married women of reproductive age, to women exposed to the risk of pregnancy, and finally to women exposed to the risk of unwanted pregnancy. The latter category, designed to measure "current unmet need" for contraceptive services and supplies, excludes

the currently pregnant, those currently seeking pregnancy, and people who know or think they are sterile. Prevalence rates are highest among women exposed to the risk of unwanted pregnancy, the narrowest denominator.

The above considerations affect the comparability of contraceptive prevalence estimates. These data come essentially from two major sources: (1) in countries with national family planning programs, the service-statistics systems maintained by the program, and (2) household surveys that ask questions about contraceptive knowledge, attitude, and practice, the so-called KAP surveys. With respect to the first, current program users of intrauterine devices (IUD's) and oral contraceptives are generally estimated by applying to the annual count of those accepting contraceptive measures the life table continuation rate found in follow-up field surveys of a random sample of acceptors of each method. Because of their expense, these follow-up surveys are conducted rather infrequently, with the result that data on current program users of IUD's and oral contraceptives are usually rough calculations. To estimate current users of sterilization, program statisticians keep a cumulative count of acceptors, which should be reduced on a cohort basis to allow for mortality of either spouse, other marital dissolution, and moving out of the reproductive age span. Users of traditional methods (such as condoms, foams, jellies) are generally estimated on the basis of the amount of supplies distributed. These procedures provide the numerator of the program figure for contraceptive prevalence. For the denominator, namely women of reproductive age in the population at large from whom acceptors are recruited, analysts are dependent on demographic census and survey statistics.

Program service statistics give only partial prevalence rates because they exclude contraceptive practice through private and commercial channels, the measurement of which requires KAP surveys (surveys of knowledge, attitudes, and practices). Under the aegis of the World Fertility Survey, these surveys are improving in quality, and government planners, as well as family planning program administrators and evaluators, are paying more attention to monitoring contraceptive prevalence by means of them. In addition to providing information on past and present contraceptive use among different population groups, KAP surveys that also investigate source of supplies and services can help to confirm or refute prevalence estimates based on service statistics of subsidized programs. To date, however, there has been little such analysis.

For the reasons discussed above, estimates of contraceptive prevalence are not strictly comparable, either temporally or spatially. Nevertheless, with the improvement in the quality and quantity of recent surveys, better information is available on the role of the public sector, recent time trends, use of different methods, and contraceptive practice by different social and economic groups.

Public-Sector versus Private-Sector Services. Government support of family planning services began in the 1950s, starting with India's adoption in 1952 of an official policy to slow its population growth. The purpose was to facilitate social and economic development by reducing the burdens imposed by a young and rapidly growing population. Surveys during the 1950s and early 1960s showed high proportions of couples saying they wanted no more children, yet few practiced contraception. With family planning programs, not only could governments satisfy a latent demand for contraception to reduce fertility and so help modernize their economies, but they could also help realize the health benefits of spacing and limiting children. In many developing countries, government programs have since grown to serve as the major source of contraceptive services and supplies. Many people, however, prefer private and commercial sources, even though the government program is free and subsidized, and prevalence rates everywhere must take account of both private and public sectors.

One might expect that as a country develops, and the contraception prevalence rate increases, the component of that rate for which the private sector is responsible will also increase. Cross-sectional data cannot strictly test this speculation, but among fifteen countries for which the prevalence rate is separated into private-sector and public-sector components, there is no correlation between the rate and either component. In six of the fifteen countries (Bangladesh, Fiji, Ghana, Mauritius, Singapore, and Thailand), the government program accounts for over three-fourths of the prevalence rate, which ranges widely from 4 percent (Ghana) to 71 percent (Singapore) of the couples of reproductive age. In another five countries (Hong Kong, South Korea, Malaysia, Mexico, and Taiwan), the government program accounts for 50 to 60 percent of the prevalence rate, which again varies widely from 36 to 79 percent of couples of reproductive age. Finally, in the remaining four countries (Costa Rica, the Dominican Republic, El Salvador, and the Philippines), the government program accounts for one-third to two-fifths of the prevalence rate, which ranges from 22 percent (El Salvador) to 64 percent (Costa Rica).

Whatever the course of contraceptive prevalence in the private sector, in developing countries the government program seems to be a major factor in its level.
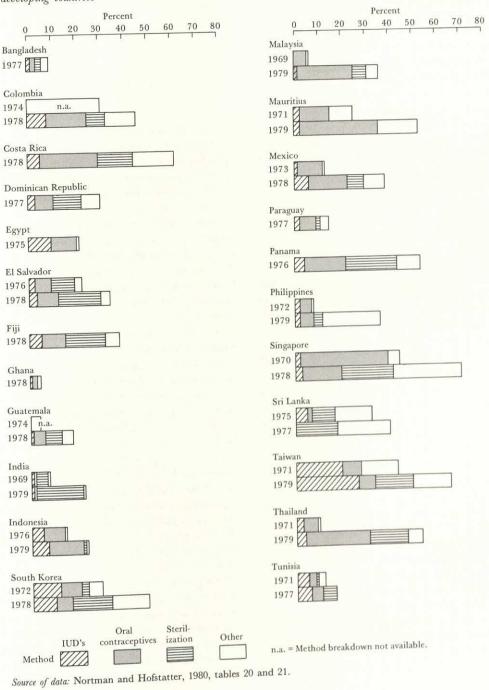
Recent Trends and Levels. Global estimates are necessarily rough, but with some plausible assumptions it is possible to estimate current contraceptive prevalence in the world. Assume that without any birth control the world's birth rate would be 50 per 1,000 population rather than the present estimate of 30. Then about 40

percent of sexually active couples of reproductive age are practicing some form of fertility control. Making some allowance for abortion, we conclude that roughly one-third of the world's couples of reproductive age practice contraception. A reasonable estimate for the developed world is a prevalence rate of about two-thirds, leaving as a residual from the world average, a contraceptive preva-lence rate of about one-fifth of the couples of reproduc-tive age in the developing world.

For many developing countries, little information is available on contraceptive use. Depicted in Figure 1 are twenty-three countries selected on the basis of availabil-ity of recent data on contraceptive use, by method. The patterns are striking in two respects. First, not only is the

FIGURE 1. *Contraceptive prevalence rates, by method, among married women aged 15–44; 23 selected developing countries*

Method: IUD's / Oral contraceptives / Sterilization / Other

n.a. = Method breakdown not available.

Source of data: Nortman and Hofstatter, 1980, tables 20 and 21.

prevalence rate increasing, but in several countries the increase is startling for the short time interval involved. In Mexico, for example, between 1973 and 1978, the prevalence rate increased threefold, from 13 percent of married women of reproductive age to 40 percent; in Colombia, from 31 to 46 percent in four years; in Mauritius, more than a doubling in eight years, from 25 to 53 percent; in Malaysia, a sixfold increase in ten years, from 6 percent in 1969 to 36 percent in 1979; in the Philippines, from 8 percent in 1972 to 37 percent in 1979 (with most of the increase accounted for, however, by the addition of rhythm to the government's program); and in Thailand, a fivefold increase in the eight years, from 10 percent in 1971 to 53 percent in 1979.

These are striking increases because significant changes in contraceptive levels do not usually come about without important changes in long-standing values and institutional arrangements. Also impressive is the diversity of these countries—in culture, religion, geography, resources, population size, and stage of economic development—which suggests, on the one hand, the difficulty of analyzing the determinants of change in contraceptive practice but, on the other hand, the prospect for rapid change from natural to controlled fertility under the right combination of circumstances.

Second, also striking in Figure 1, is the greater share of the more effective methods, particularly sterilization, that accompanies the increase in the prevalence rate. This may not be surprising in India, where the government stressed sterilization in an effort to hasten the decline in fertility; or in South Korea, Singapore, and Taiwan, where willingness to resort to sterilization is compatible with the low fertility norms these countries have achieved. More impressive is the high proportion of couples sterilized for contraceptive purposes in several Latin American countries: about 20 percent in Costa Rica, El Salvador, and Panama; 8 percent in Colombia; and 7 percent in Guatemala and Mexico, from a figure of zero as far as is known about four years before. Despite the conservative religious tradition in Latin America, sterilization and other effective means of fertility control are seen as preferable to illegal abortion, which physicians openly recognized as a serious medical problem by the 1960s.

Only three African countries are presented in Figure 1—Egypt, Ghana, and Tunisia. For the most part, conditions in Africa are less conducive to the idea of fertility control than in Asia and Latin America. Mortality rates are the highest in the world, 17 per 1,000 population, or 50 percent more than the world average. Also, with the vistas of wide open spaces, many local officials consider the continent to be underpopulated. Political and economic factors also militate against strong official advocacy of contraception.
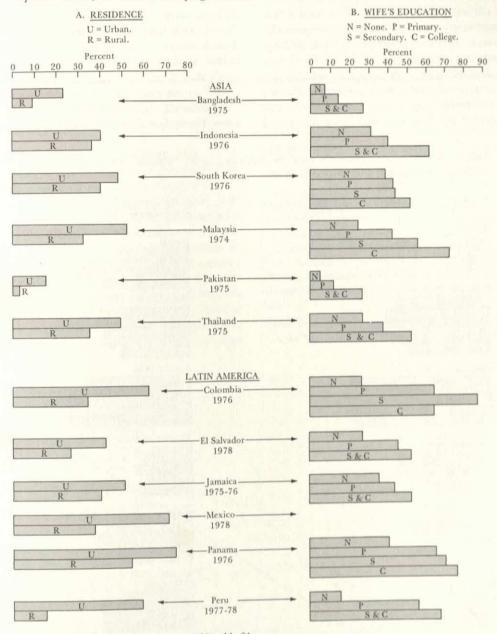
As regards China, which accounts for almost one-fourth of the population of the world, statistics on a national level are not available. From all accounts, however, fertility has declined greatly as a consequence of late marriage, widespread effective contraception, and abortion for women whose pregnancies do not fall within the birth allocations. China's latest goal is to establish the one-child family as the future norm, and to achieve zero population growth by the end of the century. In addition to China, thirty-five other developing countries have also adopted official policies to reduce the birth rate, and another thirty-one developing countries support family planning programs in the interests of health and as a human right.

Socioeconomic Differences. Since a transition from natural to controlled fertility requires a change from traditional values and behavior, it is plausible to expect cross-sectional findings to show higher contraceptive use among the more-advantaged segments of a population. This is clearly evident in Figure 2, which for twelve developing countries shows differential rates in the year specified for urban compared with rural areas, and among women with different levels of education. (The prevalence rates in Figure 2 are based on a denominator of women neither currently pregnant nor sterile, that is, "exposed" to current risk of conception, and hence are not comparable to the rates in Figure 1, for which the denominator is all married women of reproductive age.) In all cases, contraception is greater in urban than in rural areas, but there is no consistent pattern in the differences.

One might hypothesize that urban-rural differences widen with the onset of contraceptive practice in a population, reach a maximum differential at some point during the transition from little to almost universal practice, and finally become trivial at the end of the transition period. As we have seen, the transition period can be remarkably short (Colombia, Costa Rica, and Mexico, for example, had little contraceptive practice a decade ago), but during its course, the rural areas seem in some places hardly to lag, as in Indonesia, South Korea, and Sri Lanka, while in other countries, the differences are seen to be substantial. It might be noted in this connection that in Indonesia and Korea, the government family planning programs have stressed work in rural areas and are known to be very successful there, but special circumstances may have contributed to government efforts.

The prevalence level rises regularly as the wife's level of education rises. The one exception is among college-educated women in Colombia, whose prevalence rate is less than that among women of secondary-level education. A plausible explanation is the enduring conservatism of the most elite of the advantaged groups.

FIGURE 2. *Contraceptive prevalence rates, by urban-rural residence and by wife's education, among "exposed" women; 12 selected developing countries*

A. RESIDENCE
U = Urban.
R = Rural.

B. WIFE'S EDUCATION
N = None. P = Primary.
S = Secondary. C = College.

Source of data: Nortman and Hofstatter, 1980, table 24.

Age Patterns of Contraceptive Use. Age is the most important biological determinant of a woman's fecundity. It is well known that female fertility characteristically increases from zero at age of menarche to a maximum some time in the early or mid-twenties and then declines progressively to virtually zero by age 50.
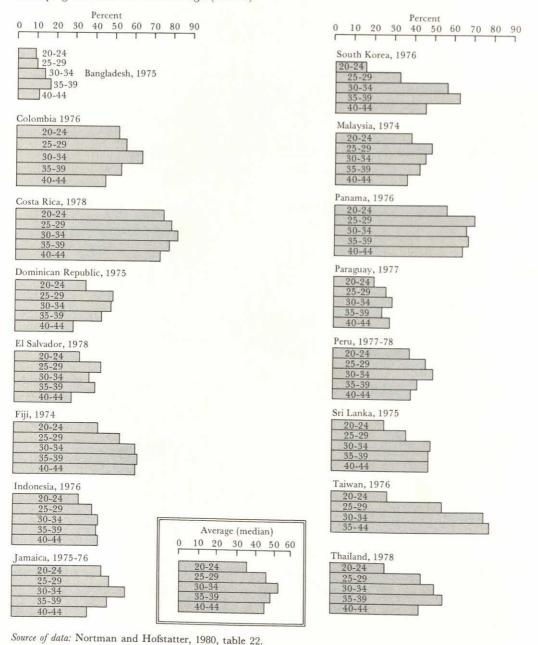
Hence, the number of births averted by contraception is a function of the age pattern of the couples practicing contraception as well as the level of their use of contraception. That is to say, at a given level of contraception among married couples of reproductive age, more births will be averted if younger women predominate among the couples using contraception, fewer if the women are typically older.

While the age pattern of those using contraceptives, as well as the level of contraception, is thus important to a

country concerned with its birth rate, individual couples associate contraception with birth spacing or limiting, not with quantification of the number of births averted. It can be argued that birth limitation is a more powerful motive for practicing contraception than birth spacing, and hence that contraceptive prevalence will be greater among older than younger couples. On the other hand, declining desires for children among younger women may prompt them not only to space but also to limit births at an earlier age than did their older sisters and mothers. As shown in Figure 3, the age differentials are in the expected direction but only up to a point and are perhaps more muted than might have been supposed. Prevalence is higher among women in their thirties than those in their twenties, but it is often less among women in their forties than women in their thirties. (It should be noted that since these rates are based on women "exposed" to the risk of pregnancy, those pregnant at the time of the survey, as well as sterile couples, are not considered in the prevalence rate of any age group.) On av-

FIGURE 3. *Contraceptive prevalence rates, by wife's age, among "exposed" women; 16 selected developing countries and their average (median)*

Source of data: Nortman and Hofstatter, 1980, table 22.

erage, for the countries shown in Figure 3, among the five-year age groups from low to high among "exposed" women aged 20–44 the prevalence rates are 37, 47, 51, 48, and 44 percent in order.

Since number of children is highly correlated with mother's age, a discussion of contraceptive prevalence among women of different family sizes corresponds to what has been said about the age of women. That is, prevalence of contraception increases with number of living children up to four or five but tends to decrease thereafter.

Contraceptive Prevalence and the Birth Rate. Many factors influence fertility. The four major proximate variables are marriage patterns, duration of lactation following a birth, contraception, and induced abortion. The crude birth rate, that is, births per 1,000 population, is also affected by the age structure. Thus the relation between contraception and the crude birth rate cannot be perfect, but because of the importance of contraception, the relation is close. This is shown in Figure 4, which gives the line of best fit to thirty-seven points (thirty-two countries, five with points at two time periods) relating the prevalence rate and the crude birth rate a year later. This line suggests that every increase of 2.4 percentage

points in contraceptive prevalence (x-axis) is associated with a 1-point decline in the birth rate (y-axis). According to this relation, the crude birth rate would be 47 if no couples practiced contraception. Because contraceptive practice is not always perfect, a few births would likely occur even if all couples practiced current methods. The line suggests that with everyone practicing contraception, the birth rate would be 5 per 1,000 population.

Dorothy L. Nortman

See also ABORTION; FAMILY PLANNING PROGRAMS; FERTILITY DETERMINANTS; LAW AND FERTILITY REGULATION.

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International Family Planning Perspectives. Published quarterly since March 1979 by the Alan Guttmacher Institute for the
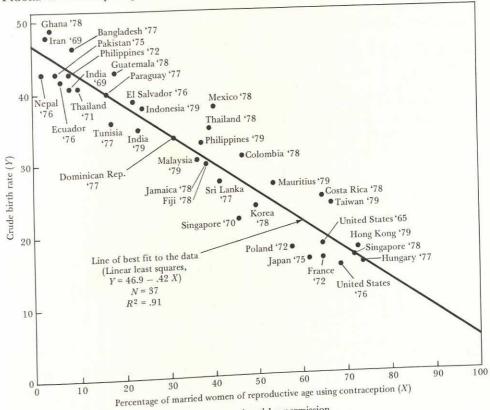
FIGURE 4. *Contraceptive prevalence and crude birth rates*

SOURCE: Nortman and Hofstatter, 1980, fig. 4; reprinted by permission.

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2.
UNITED STATES OVERVIEW

Contraceptive technology entered a new era in the early 1960s with the development of the pill, the improvement of intrauterine devices (IUD's), and the simplification of sterilization techniques. The widespread availability and acceptance of these three methods have led experts in the field to refer to this period as the "contraceptive revolution" (Westoff and Ryder, 1977). Indeed, by 1975, approximately three out of every four married couples in the United States used one of these three means of contraception (Westoff and Jones, 1977).

The extensive use of contraceptives can be traced to earlier origins, however. A broad spectrum of birth control methods existed before 1960, some of which, when used correctly and consistently, were highly effective. These included the condom, diaphragm, jellies and creams, suppositories, rhythm, douche, withdrawal, abortion, and abstinence. Evidence of the popular use of birth control prior to the "contraceptive revolution" period can be found, for example, in a 1955 study (Freedman, Whelpton, and Campbell, 1959). Of the white married women surveyed in this study, the first of a continuing series of national fertility surveys, 70 percent had used contraception at some time in the past while 94 percent of the fecund nonusers intended to use contra-

ceptives at some future time. Moreover, these figures exclude use of abortion.

An examination of American fertility trends reveals an almost continual decline in the birth rate during the nineteenth and early twentieth centuries, much of which is certainly attributable to the use of contraception as well as abortion. Previously, in the colonial period, American fertility had been among the world's highest; the average married woman who survived her reproductive years bore eight children (Westoff, 1964). However, as the character of American society changed fertility fell steadily in both rural and urban areas; at its low point in the 1930s, during the great Depression, the average number of children per family was close to two. This long-term decline in the birth rate over the past two centuries occurred in association with the urban transformation of the country, the gradual filling up of prime agricultural land, a trend toward secularization, a redefinition of the status of women, an increase in average level of education, change in the occupational structure, a shifting ethnic and sex composition due to immigration along with greater internal mobility of the population, periodic experience with collapse in the economic system which the emergent urban institutions were not equipped to handle, and through it all an improvement in level of living that led to extension of the average length of life. The relative importance of these and possibly other factors has not been sorted out and probably never will be since historical data of sufficient detail for adequate analysis do not exist.

The postwar rise in fertility was widely regarded as the termination of this long secular decline in American fertility. Scientific interest focussed more on the genetic and economic consequences of low fertility than on its determinants. While there was some attention in the late 1940s to the possibility of a small upturn in fertility as couples had births deferred due to the war and the poor economic conditions which preceded it, demographers were as unprepared generally as any other group for the upsurge of the postwar decade. Leading scholars of the time tended to interpret the baby boom in its early stages as a matter of temporal variations around a low central value. The concern of the 1930s regarding the inability of the American population to reproduce itself was quieted by 1960, when the fertility of the white population was 50 percent above its 1930 low. Over the same period nonwhite fertility had increased by about 70 percent (Westoff, 1964).

Although the baby boom represented a surge in the number of births, the average number of children per family did not increase radically. The two-child norm has continued to characterize American fertility in the second half of the twentieth century. The years between 1950 and 1959 exhibited the highest fertility levels, with

fertility reaching a peak of 3.7 births per woman in 1957. According to Westoff, however, "only a minor part of the baby boom can be attributed to increases in the proportion having three or more births" (1978, p. 80). Rather, the proximate causes of baby boom can be attributed primarily to earlier age at marriage and earlier childbearing by all women, thus producing a large clustering of births in a given time period; plus a fertility-inducing ambivalence of couples toward having a third or fourth child (Bouvier, 1980). In contrast to the depression years, economic conditions in the 1950s put relatively less pressure on couples to restrict family size. An unwanted pregnancy during the baby-boom years generally did not inflict serious economic hardship as it had in the 1930s, thus reducing the need for efficient contraceptive use. The increase in births was partially the result of a greater number of accidental pregnancies (Bouvier, 1980), signaling the key role motivation plays in preventing unwanted fertility, but was also a result of change in ideal family size. The childbearing cohorts of the 1930s and 1950s possessed almost identical methods of birth control and yet produced generations in completely different proportions. From this experience it can be readily seen that access to family planning methods alone is not sufficient for effective contraceptive use. Motivation is also a key ingredient.

Although almost every subgroup in American society contributed to the baby boom, blacks and Roman Catholics produced a disproportionate number of the births. Fertility trends among American blacks have paralleled those of whites, although black fertility rates have consistently been higher (Bouvier, 1980). Fertility among blacks reached a low point in the 1930s, with a total fertility rate of 2.5 as compared with 2.1 for whites. During baby-boom years, black fertility peaked at 4.3 births per woman (versus 3.7 births for whites), began to decline in 1962 (as did white fertility), and reached a level of 2.3 births in 1977. By 1977 the total fertility rate for whites had dropped below 2.0 births per woman.

Fertility among Roman Catholics has traditionally been higher than among non-Catholics. However, in recent years, a trend toward convergence has occurred wherein almost as large a proportion of Catholic as non-Catholic married couples are practicing contraception (Bouvier, 1980). During the baby boom, desired family size for Roman Catholic women was 3.5 births as compared to 2.6 for non-Catholics. By the late 1960s, however, Catholic fertility began to fall more precipitously than that of non-Catholics, resulting in completed family size of only 2.3 children by 1971–1975 (Westoff and Jones, 1977). The difference between Catholic and non-Catholic fertility has thus virtually disappeared.

An analysis of contraceptive practice in the United States reveals an interesting evolution in the use of the most popular methods. The pill continues to attract younger women in the early stages of family formation, that is, those married fewer than ten years. In 1973, more than 53 percent of all married women under 30 years of age who practiced contraception used oral contraceptives. The predominance of pill use has been especially marked among young black women; 44 percent used the pill in 1973, compared to only 22 percent in 1965. In contrast, of all women between the ages of 30 and 44 years, only 21 percent relied on the pill (U.S. Congress, 1978, p. 23). Because of the well-publicized risk of cardiovascular deaths at older ages as well as other side effects associated with pill use, women at risk of unwanted pregnancy for a prolonged period have increasingly turned to other methods. The method most commonly selected by women who have completed their childbearing is surgical sterilization, either male or female.

By 1975, sterilization was the single most popular method for couples married ten years or more. In the early 1970s vasectomies were more prevalent than tubal ligations, but by 1978, 59 percent of sterilizations were obtained by women, in contrast to 30 percent six to seven years earlier ("1.1 Million Sterilizations . . . ," 1980). Simplification of techniques for female sterilization largely accounted for this trend. IUD use, although accounting for a much smaller proportion of contraceptors than either the pill or sterilization, also made substantial gains between 1965 and 1973, increasing from 1.2 to 9.6 percent of all women using contraception (U.S. Congress, 1978).

In 1978, the total fertility rate reached an all-time low of 1.8, a level that clearly points to the widespread use of contraception. Much of the decline in fertility in recent years has been attributed to a reduction in unwanted and mistimed births among married couples (Weller and Hobbs, 1978). The spread of family planning programs throughout the country, supported by public funds, has made possible equal access to contraception by rich and poor alike. In addition, legal abortion sevices have become increasingly available since 1973 to further avert unwanted births. However, a large unmet need for abortion services still exists. In 1979, the estimated proportion of women in need of abortion services but unable to obtain them because facilities were either unavailable or inaccessible was 29 percent (Henshaw et al., 1981). These data indicate a substantial increase in availability of abortion services in a very short period.

As in every year since 1973, women who obtained abortions in 1978 were mainly young, white, unmarried, and childless. As reported by Stanley Henshaw and colleagues, "About one in three abortions in 1978 was obtained by teenagers; three in four, by unmarried women; and two in three, by whites" (1981, p. 7). Although contraceptives are accessible to the population through fam-

ily planning clinics and through other sources, the continued recourse to abortion points up the need for better ways to encourage their use.

Recent trends in contraceptive practice would be difficult to discern without the data provided by a series of major fertility surveys undertaken in this country. Metropolitan areas were the sites of the first large-scale fertility studies, of which the Indianapolis Study in 1941 was the earliest. Its purpose was to investigate the underlying social and psychological determinants of behavior affecting fertility. The Indianapolis Study demonstrated that contraceptive practice could account both for low fertility and for fertility differentials between social classes (Freedman, 1961–1962). One bit of evidence for this finding was provided by the currently childless couples in the study among whom one-third to one-half were childless by choice.

The successor to the Indianapolis Study was the Family Growth in Metropolitan America study, more commonly referred to as the Princeton Study. Conducted in 1956 and developed in parallel with the Growth of American Families (GAF) studies (see below), the Princeton Study yielded substantial data on fertility differentials by religious group, differences which have all but disappeared as of this writing. An interesting finding of the Princeton Study, confirmed in both the GAF and Indianapolis studies, was the large proportion of all pregnancies that were unplanned (Freedman, 1962, p. 219). American families were shown to be ineffectual planners in their use of contraception, many employing methods they considered unreliable, and only turning to family planning when the pressures of a growing family became too great. Much of this behavior can be explained by the economic and social conditions which prevailed in this era known as the baby boom, the details of which have already been described.

The earliest nationwide surveys investigating contraceptive prevalence in the United States were the Growth of American Families (GAF) studies, conducted in 1955 and 1960 by the University of Michigan and the Scripps Foundation of Miami University. Both the 1955 and the 1960 studies sought to provide a basis for fertility predictions; the 1960 study, which reinterviewed some women from the 1955 study, explored topics given only brief attention in 1955 and also sought to learn how well wives interviewed in 1955 had been able to predict the number of children they would have during a five-year period and whether their expectations regarding total family size had changed. Findings from the 1955 study indicated that American wives in all socioeconomic groups were coming to share similar values regarding ideal family size, with an average expectation of 3.0 births per woman (Campbell, 1962). The 1955 study found that

greater numbers of couples overall were having moderate-sized families (2–4 children). Few couples were having no children or only one child. Originally, it was believed that the baby boom was brought on by many couples having 5 or more children. However, this was not the case.

In 1962, a special time-series project was conducted by the University of Michigan to assess fertility expectations for that year and to measure those expectations against the findings of the GAF studies. The results indicated that the percentage of couples who had completed their childbearing increased from 1955 to 1960 or 1962, although some of this increase may be due to certain methodological differences among the studies (Freedman, 1963).

The National Fertility Study (NFS), initiated in 1965, was conducted by various universities, most recently Princeton University, at approximately five-year intervals. The NFS provides crucial information on historical trends as well as time series of data on fertility expectations or intentions for both white and nonwhite populations. An important finding of the 1970 survey is that group differences in the use of contraception have shown a definite trend toward convergence. The most effective methods are being used in about the same proportion by women of different educational, religious, and racial backgrounds. There is, however, a distinct racial difference in the incidence of male and female sterilization procedures; vasectomies among black males were practically nonexistent in 1970 (Westoff and Ryder, 1977).

The largest and most recent fertility study is the National Survey of Family Growth (NSFG). Conducted by the National Center for Health Statistics, this survey is designed primarily to assess the family planning practices of the U.S. population. The NSFG, initiated in 1973, was followed by a second survey in 1976 in which approximately 9,000 women were interviewed who were currently or previously married or who were never married but had offspring living with them.

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Directly related are ABORTION, *article on* UNITED STATES; FAMILY PLANNING PROGRAMS, *article on* UNITED STATES. *See also* ADOLESCENT FERTILITY; FERTILITY TRENDS. *For discussion of the social and legal frameworks for contraceptive use, see* BIRTH CONTROL MOVEMENT; LAW AND FERTILITY REGULATION, *article on* UNITED STATES.

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3.

UNITED STATES SINCE 1970

Great changes took place in contraceptive practices in the United States in the 1960s and 1970s. Use of oral contraceptives ("the pill") increased, and surgical sterilization for the control of fertility rose markedly. This arti-cle documents patterns of contraception and sterilization from two surveys conducted among American women in 1976. Abortion is excluded because it was difficult to obtain accurate information on it in household interviews. Data presented are the latest nationwide statistics available; the figures for married, widowed, divorced, and separated women are from the 1976 National Survey of Family Growth (NSFG) conducted by the National Center for Health Statistics, in which about 9,000 women were interviewed who were currently or previously married, or who were never married but had offspring living with them.

Married Women. Table 1 shows for total, white, and black women the distribution of currently married women 15–44 years of age according to their exposure to the risk of conception. It also shows for fecund couples their contraceptive status. In 1976, 30 percent of all wives (or their husbands) were sterile. Twenty-one percent were fecund but not using any method of contraception (7 percent because they were pregnant or had just completed a pregnancy, 6 percent because they were trying to become pregnant, 8 percent for other reasons). Methods other than sterilization were used by 49 percent of the wives.

From Table 1, it is possible to calculate the percentage using contraceptive methods (other than sterilization) among those wives who at the time of interview were at risk of an unplanned pregnancy (i.e., not surgically or nonsurgically sterile, pregnant, postpartum, or trying to become pregnant). About 86 percent of women at risk were using a contraceptive method in 1976. Black women and low-income women of all races at risk of an unplanned pregnancy were less likely to practice contraception than were white women and higher-income women. ("Low income" denotes those below 150 percent of the poverty line; the poverty index in 1976 centered around an annual family income of $5,815 for a nonfarm family of four. Thus 150 percent of the poverty line implies an average annual family income of $8,723.) About 87 percent of white women at risk were using a contraceptive method in 1976, about 77 percent of black wives. Some 82 percent of low-income wives at risk were using contraception, compared to 89 percent of higher-income wives. Black women of low income were least likely to use contraception, but the proportion (73 percent) was still quite high.

In 1976 30 percent of wives (or their husbands) were sterile—2 percent nonsurgically so, 9 percent for non-contraceptive reasons and 19 percent for reasons at least partly contraceptive. Sterilizations were classified as contraceptive or noncontraceptive according to responses to a question regarding the family planning intent of the operation. In 1976, this question read: "Was one reason

TABLE 1. *Contraceptive status of currently married women aged 15–44 by poverty status, and race, United States, 1976*[1]

Contraceptive status	Total[2]			White[3]			Black[3]		
	Total[4]	<150% of poverty	≥150% of poverty	Total	<150% of poverty	≥150% of poverty	Total	<150% of poverty	≥150% of poverty
Number (in thousands)	27,185	3,435	20,806	24,518	2,857	19,280	2,144	474	1,202
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sterile	30%	27%	30%	31%	28%	31%	24%	26%	24%
Nonsurgical	2	1	2	2	(1)	2	3	(2)	2
Surgical	28	26	29	29	27	29	22	24	22
Noncontraceptive	9	7	9	9	7	9	9	8	9
Female	8	7	8	8	7	8	9	8	9
Male	1	(0)	1	1	(0)	1	(0)	—	(0)
Contraceptive	19	19	20	20	20	21	13	16	13
Female	10	15	9	10	16	9	11	16	10
Male	10	4	11	11	5	12	2	(1)	3
Fecund	70	73	69	69	72	69	76	74	76
Nonusers of contraception	21	25	19	20	24	19	30	28	29
Pregnant, postpartum	7	9	6	7	9	6	7	7	8
Seeking pregnancy	7	6	7	6	6	6	10	(5)	11
Other nonusers	8	10	6	7	9	6	14	17	10
Users of contraception	49	48	50	49	48	50	45	45	47
Pill	22	25	23	23	25	23	22	20	25
IUD	6	5	6	6	5	6	6	8	5
Diaphragm	3	2	3	3	3	3	2	(1)	(2)
Condom	7	5	8	7	6	8	5	(3)	5
Foam	3	3	3	3	2	3	4	(3)	5
Rhythm	3	2	4	4	2	4	1	(3)	(1)
Withdrawal	2	2	2	2	1	2	2	(3)	(2)
Douche	1	2	1	1	2	0	3	(3)	(1)
Other	1	2	1	1	2	1	1	(1)	(1)

[1] Percentages that have a standard error that is more than 25 percent of the estimate itself are marked with parentheses to caution the reader. Percentages may not add to totals because of rounding. Dashes indicate no cases in the category.
[2] Total includes "other" races and therefore exceeds the sum of white and black.
[3] Women of Hispanic origin are included as either white or black if they were designated as such by the interviewer. Table 2 is based on a direct question concerning ethnicity.
[4] The number of women in the two income groups does not add to the total because information on income is missing for some women.
Source of data: Ford, 1978a, tables 1–3.

for the operation because you had all the children you wanted?" Certainly the motivation for a sterilization is often more complex than this question allows, and answers from this question provide only a rough division of sterilizations into contraceptive or noncontraceptive.

The proportion of sterilizations (for all reasons) performed on the male partner was 38 percent for white couples; among black couples the proportion was very small. Both white and black low-income couples were less likely to use male sterilization than higher-income couples.

The survey showed a leveling off of the increase in the use of oral contraceptives that had been observed from the early 1960s to the early 1970s. Nevertheless, in 1976 about 22 percent of wives were using the pill, nearly half of all those using contraception. Among couples in which neither partner had been sterilized, no other method comes close to the pill in popularity. Moreover, percentages of currently married women using the pill were very similar among whites and blacks and among the different economic groups. There was comparatively little use of other methods (except sterilization). About 7 percent used the condom and 6 percent the intrauterine device (IUD).

Expressed as a percentage of all those using contraception (other than sterilization), the pill and IUD accounted for 58 percent of use by white wives, and 62 percent among black wives. Use of nonmedical methods (condom, foam, rhythm, withdrawal, and douche) accounted for 33 and 31 percent of method use among whites and blacks respectively.

Data on contraceptive use for married women of His-

TABLE 2. *Contraceptive status of currently married women aged 15–44 of Hispanic origin, United States, 1976*[1]

Contraceptive status	Total	Hispanic
Number (in thousands)	27,185	1,673
Total percentage	100.0	100.0
Sterile couples	30%	21%
Nonsurgical	2	2
Surgical	28	19
Noncontraceptive	9	8
Female	8	7
Male	1	(1)
Contraceptive	19	11
Female	10	7
Male	10	4
Fecund couples		
Nonusers of contraception		
Pregnant, postpartum, seeking pregnancy	13	21
Other nonusers	8	11
Users of contraception		
All methods	49	48
Pill	22	21
IUD	6	10
Diaphragm	3	2
Condom	7	6
Foam	3	4
Rhythm	3	3
Withdrawal	2	(1)
Douche	1	(0)
Other	1	(1)

[1]Percentages that have a standard error that is more than 25 percent of the estimate itself are marked with parentheses to caution the reader. Percentages may not add to totals because of rounding.
SOURCE: Ford, 1978c, table 1; reprinted by permission.

panic origin are shown in Table 2. Women of Hispanic origin can be black or white, although most are white. Fewer couples with wives of Hispanic origin were sterile (20 percent) compared to black (24 percent) and white (31 percent) couples. About 11 percent of the Hispanic couples had been sterilized for contraceptive reasons. Slightly more than a third of these operations were performed on the male partner.

Of those women at risk of an unplanned pregnancy (not pregnant, postpartum, seeking pregnancy, or sterile), about 82 percent were using contraception. As with white and black women, the pill accounted for almost half of contraceptive use by Hispanic women, with the IUD and the condom the next most popular methods. No other methods were used by more than 5 percent of Hispanic women.

Widowed, Divorced, and Separated Women. Similar information was collected for the subgroup of ever-married but not currently married women, which was about one-eighth the size of the currently married group and somewhat older. About 33 percent were sterile, 30 percent as the result of a sterilizing operation. The proportion surgically sterile was similar for white and black women.

Of the women who were not sterile, 45 percent reported use of a contraceptive method. The preference for the pill and the IUD over other methods was even stronger than among married women. A larger proportion of white women than black women were using contraception.

Never-married Women 15–19. Complementing these surveys of ever-married women, Melvin Zelnik and John F. Kantner (1977) conducted a series of national surveys of women aged 15–19. Data presented here are drawn from their 1976 survey in which some 2,000 women were interviewed.

Table 3 shows the percentage of sexually experienced, never-married women aged 15–19 according to contraceptive method used at last intercourse. There was a substantial amount of unprotected intercourse among teenagers. Indeed, 37 percent used nothing at all. Unprotected intercourse was most common for the youngest women interviewed.

Somewhat more risk taking was observed among black young women (44 percent used no contraceptive method) than among white young women (42 percent). Differences are moderate only. The relative gap was more pronounced among the older than the younger women: among those 18–19 years of age, 39 percent of black women compared to 27 percent of white women used no method at last intercourse. The survey sample was too small to permit discussion of risk taking by Hispanic young women.

Among methods used, the pill, condom, and withdrawal were the three most popular; the pill was used most often, especially by women 18–19 years old.

The choice of methods among users varies by race. The pill dominates use by black women more than white women, male methods (condom and withdrawal) were used more by white women and their partners than black women and their partners, and black women were more likely to use douches.

Summary. As of the mid 1970s the pill and surgical sterilization were the main methods used by U.S. married couples to prevent pregnancy. The overwhelming majority of couples exposed to the risk of unplanned pregnancy were protected, and most employed highly effective methods. Low-income women and black women were less likely to use contraception than higher-income women and white women, but ethnic, racial, and socioeconomic differentials had diminished to low levels.

TABLE 3. *Contraceptive method used at last intercourse by sexually experienced never-married women aged 15–19, by age and race, 1976*

Method	Age and race								
	All			White			Black		
	15–19	*15–17*	*18–19*	*15–19*	*15–17*	*18–19*	*15–19*	*15–17*	*18–19*
Number	786	420	366	378	205	173	408	215	193
Pill	31	22	43	30	22	41	35	31	40
IUD	2	1	3	3	2	4	3	1	4
Condom	13	15	9	13	14	12	10	14	6
Douche	2	2	2	1	2	1	5	5	6
Withdrawal	11	15	5	12	16	8	3	5	2
Other	5	3	6	5	3	8	2	1	3
None	37	42	30	35	42	27	42	44	39
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Zelnik and Kantner, 1977; reprinted by permission.

Among separated, widowed, and divorced women, use of the pill and sterilization was also very high. Although racial differences were observed in the proportion of users among this group, it is difficult to determine the percentage at risk of an unplanned pregnancy, since little is known about the extent of sexual activity among widowed, divorced, and separated women.
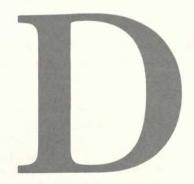
Finally, many teenage women were exposed to unprotected intercourse, and even among those using contraception, some employed methods such as withdrawal and douche, which afford only modest contraceptive effect. Nevertheless, data collected in 1976 demonstrated an increased use of contraceptives among sexually active teenagers compared to data collected earlier in the 1970s.

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Directly related are ABORTION, *article on* UNITED STATES; FAMILY PLANNING PROGRAMS, *article on* UNITED STATES. *For discussion of the legal framework for contraceptive use, see* LAW AND FERTILITY REGULATION, *article on* UNITED STATES. *See also* ADOLESCENT FERTILITY.

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D

DATA COLLECTION

1. National Systems
2. International Systems
3. United States Census

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1.

NATIONAL SYSTEMS

The major data-collection systems that can provide a variety of demographic and social information are population censuses, civil registration systems, and sample surveys. These systems are basically different from but complementary to one another. Each is best suited to satisfy the needs for data on specific types of population phenomena or data that pertain to the study of specific aspects of population. All three sources are required to produce the full range of statistics needed for a comprehensive and timely understanding of demographic developments and for planning, policy making, and research purposes in the population field.

The population census is defined in the United Nations publication *Principles and Recommendations for Population and Housing Censuses* (1980) as "the total process of collecting, compiling, evaluating, analysing and publishing or otherwise disseminating demographic, economic and social data pertaining, at a specific time to all persons in a country or in a well-delimited part of a country" (p. 2). It is the primary source of basic benchmark statis-

tics on the size, distribution, composition, and other social and economic characteristics of the population. A population census has four basic features: individual enumeration of all units, universality within a well-defined territory, simultaneity, and defined periodicity. The first feature means that each individual is to be enumerated separately and that the characteristics of each person are separately recorded. The second feature requires that the census cover a precisely defined territory and that every person present or residing within that area be enumerated. Simultaneity requires that each person be enumerated as nearly as possible at the same well-defined point of time. Defined periodicity requires that censuses be taken at regular intervals so that comparable information can be made available in a fixed sequence. It follows from these features that data from the census can be presented and analyzed in terms of statistics of persons, married couples, families, and households for a wide variety of geographical units ranging from the country as a whole to individual small localities or city blocks.

A civil registration system is defined in the United Nations publication *Principles and Recommendations for a Vital Statistics System* (1973) as "the continuous, permanent, compulsory recording by registration of the occurrence and characteristics of vital events . . . in accordance with the legal requirements in each country" (p. 156). Information collected by this system pertains to one or more of the following types of events: birth, death, fetal death, marriage, divorce, annulment, judicial separation, adoption, legitimation, and recognition. Registration systems

are established and registrations are carried out primarily to assure that uniform legal records exist for various types of vital events as provided by law and regulation in each country. However, the usefulness of the information obtained by the civil registration system as a major source of demographic statistics, especially with respect to the study of population dynamics, has long been recognized.

No similarly concise yet comprehensive definition for the term "sample survey" is available. Different purposes and methodology associated with various sample surveys can be added to factors related to type, design, and execution to make one survey differ from another. Such factors include whether the survey is carried out on an *ad hoc* basis or in the context of a permanent national household survey; whether the survey is carried out by a governmental statistical agency or some other organization; the type and size of the sample; the nature of the training provided by the field staff; the type and layout of the questionnaire used; and the type and extent of manual and computer editing.

For some countries another major source of demographic information is the population register. This, like the civil registration system, is established and maintained primarily for legal and administrative purposes and the statistics it generates are a by-product. A comprehensive population register must record not only such vital events as birth, death, and marriage but also the movement of persons and families from place to place. For this reason, a population registration system is not a realistic option for countries until they have at least established a complete and well-functioning civil registration system. Therefore, no further consideration is given to this subject in this article.

The complementarity of the population census, civil registration system, and the sample survey in gathering data needed in the population field is well illustrated by Table 1, which indicates the relative strengths and weaknesses of each method of data collection in terms of seven criteria. It is clear from this table that each method of data collection is weak in some areas and strong in others so that none alone can satisfactorily meet all data needs in the population field.

Stock and Flow Data. All statistical investigations have a time reference on the basis of which demographic data can be classified into stock data and flow data. Data on the state of affairs at a given point of time are called stock data and those referring to changes of state are called flow data. Total and regional population obtained from the 1980 Census of Population of the United States, the number of married men in the same census, the proportion of females aged 15–49 in Japan in 1935, the percentage of females with four or more children wanting no more children in Gambia in 1960—all these facts refer to a particular point of time and are therefore stock data. On the other hand, the number of men marrying in a given year, marital fertility rates for 1980, the rate of natural increase of Bolivia in 1979, the percentage of long-term immigrants to the United States in 1977 with graduate degrees in engineering—all refer to a process that occurs over an interval of time and are therefore flow data.

TABLE 1. *Intrinsic characteristics of data collection methods in providing data needed to estimate fertility and mortality: A comparison using seven criteria*

Criteria	Data collection method		
	Census	Civil registration	Sample survey
Topical detail (richness and diversity of subject matter)	Moderate	Weak	Strong
Accuracy	Moderate	Strong	Moderate
Precision (absence of sampling errors)	Strong	Strong	Weak
Timeliness of data	Weak	Strong	Strong
Geographic detail (subgroups, etc.)	Strong	Strong	Weak
Obtaining information on population at risk	Strong	*	Strong
Ease of organization in a developing nation	Moderate	Weak	Strong

*In general, civil registration systems do not provide information on the population at risk. However, for some measures, such as infant mortality, civil registration systems do provide data on the population at risk. Also, historical analysis is possible when civil registration system data from earlier periods are available.
SOURCE: United States, National Academy of Sciences, 1981, table 1-5.

Some stock information expresses the accumulated experience of a past flow. For example, the average number of children per married couple, or family size, is a stock function effectively covering a span of ten to twenty or thirty years flow experience. Stock data may also provide a means of estimating net flow. For example, intercensal population growth may be measured from the total population figures obtained in two consecutive censuses.

Population census data are primarily stock data as they refer to characteristics at a particular point of time. Censuses can also provide flow data by collecting retrospective information such as the number of children ever born to a woman, income in the last twelve months and, as mentioned before, by estimating net flow from consecutive censuses. In contrast, a civil registration system records vital events as they occur over time and provides only flow information. Sample surveys may investigate both the characteristics and changes of a selected group and therefore can provide both stock and flow data. Flow data in a survey can be gathered through asking retrospective questions and, in surveys with multiple rounds, through changes in the stock information obtained in successive survey rounds. (Similarly, a population register records both incidence and prevalence information for the whole population and therefore provides both stock and flow data.)

Population Census. The population census is a principal means of collecting basic population information. Since a census implies that each individual is enumerated separately, characteristics are separately recorded, and a precisely delineated area is covered, a census can provide the complete coverage needed for many purposes, including benchmark data for samples and projections. The choice of topics to be included in any national census depends upon a number of factors, including the needs of a country to be served by the census, the willingness and ability of respondents to give adequate information, and the total resources available for the census operation. The topics covered are usually drawn from the following list: (1) the geographic and migration characteristics of the population, including place of birth, place and duration of residence, and place of previous residence; (2) household or family characteristics such as the relationship to head or other reference member of the household; (3) demographic and social characteristics such as age, sex, marital status, citizenship, religion, language, ethnicity; (4) fertility and mortality characteristics such as number of children born alive and children surviving, age at marriage, duration of marriage, live births and deaths of infants born within the twelve months prior to the census, and maternal orphanhood; (5) educational characteristics such as educational attainment, literacy, school at-

tendance, educational qualifications; and (6) economic characteristics such as activity status (whether or not employed, retired, keeping house, etc.), occupation (kind of job a person performs; for example, nurse or truck driver), industry (line of business in which job is located; for example, automobile manufacturing or banking), status in employment (whether employer, employee, self-employed, unpaid family worker, etc.), time worked (for example, weeks worked in previous year or hours worked in previous week), income, and employment in the public or private sector.

It must be reemphasized that not every census will investigate all of these topics. Because a population census is a massive, costly, and complex statistical operation, it is unwise to attempt to collect all information on a large number of topics from all members of the population. Therefore, a careful selection of topics is a very important part of census preparation. (For a more detailed discussion of the topics to be investigated in population censuses, see United Nations, 1980, chap. 5.)

Population census data can serve as denominators for the computation of vital rates. They can also be used to check on the reliability of current birth statistics. Individual census returns on infants under one year of age and birth registration reports for the year preceding the census can be used to check the completeness of one or the other type of investigation. Linkage of death reports with census returns has been used to compare the information on characteristics of the deceased as reported in the two sources. In the establishment of a civil registration system, census results on the geographic distribution of the population can be useful in planning the locations of registration offices.

Census data can provide a frame—whether it be a list of small areas, structures, households, people, or groups of households—for subsequent sample surveys. In fact, censuses can be the only such frame for countries that lack good maps, village lists, or a register of the population or households. For many demographic sample surveys, the main census results may be available for use as supplementary information covering those subjects not investigated in the surveys.

Census results, updated by vital and migration statistics, can provide a basis for estimating the future size, distribution, and other characteristics of the population of the total country and of subnational districts.

A population census is usually carried out once or twice each decade. As a result, extensive administrative and technical resources can be specially mobilized in an effort to keep the data gathering and processing operations under as much control as possible. In the 1970 World Population Census Decade, which covered the period 1965–1974, a total of 187 countries or areas in the

world took a census of population. In the 1980 World Population Census Decade covering the period 1975–1984, a total of 195 countries or areas are expected to conduct a census of population. By 1980, 73 of these countries had already conducted their census and 22 of these countries, which have a quinquennial census program, will conduct another census in 1980–1984.

Civil Registration System. Vital statistics collected through the civil registration system are incidence, not prevalence statistics. They provide a measure of the occurrence of certain events during a specific period of time and therefore are flow data. Since registration is a continuous function, it implies that the function is a permanent one. A civil registration system maintained for a short period and then allowed to lapse will not produce useful current vital statistics. Registration of vital events can best be ensured by making it legally compulsory, although in some countries the law assigns the responsibility for registration to the family, and in others to health personnel and those responsible for arranging funerals.

Since the information collected through civil registration relates to vital events plus certain characteristics of persons directly concerned with such events, the data are different from those collected through the population census. However, a few personal characteristics such as age and sex are common to both collection systems.

The topics included in the United Nations recommendations as "first priority" topics in civil registration of vital events of all types are the date and place of occurrence, date of registration, and place of usual residence. For live births, other "first priority" topics include type of birth (i.e., single or multiple issue), attendant at birth or delivery, sex, the infant's legitimacy status and weight at birth, the mother's age, number of children born alive, and duration of marriage. For deaths, they include cause of death, certifier, and decedent's age, sex, and marital status, gestational age, and the mother's age, number of children born alive, number of previous fetal deaths, and duration of marriage. For marriage, they include type of marriage (type of ceremony or process), and age and previous marital status of bride and groom. For divorce, they include age, number of dependent children, and duration of marriage. (For a detailed discussion of the topics that are recommended to be investigated in a civil registration system, see United Nations, 1973.)

Although vital statistics can also be derived from population and other censuses or from surveys, or as a by-product of administrative controls, experience has shown that civil registration is the only reliable method for obtaining a continuous and current record of events occurring throughout a period.

However, a national civil registration system is more difficult to establish and maintain as a reliable instrument for demographic measurement than are population censuses or sample surveys since, to function effectively, it must be extensive in time and space. An effective civil registration system must provide a means for detecting and recording all births and deaths, marriages, divorces, and so on, regardless of when in the year or where in the nation each event took place.

Sample Surveys. Sample surveys are widely recognized as an important tool for obtaining demographic data, particularly with respect to fertility and mortality, and for demographic research for countries at all stages of statistical development. Sample surveys have also been carried out as field checks on the quality of census results and registration. Although sample surveys can supply fertility and mortality data in the absence of a reliable civil registration system, they can never adequately meet the full range of needs served by a national civil registration system. On the other hand, sample surveys are necessary for obtaining population data that might not otherwise be available even where the registration system is complete.

Recently, in response to rapid social and demographic changes, many developing countries are recognizing the importance of establishing an intercensal program of household sample surveys. A permanent survey mechanism capable of conducting continuous statistical investigation, if properly coordinated with related activities, can produce demographic and other social data complementary to those available through population censuses, civil registration and other administrative records, and other types of nonhousehold surveys. It also facilitates studies leading to refinement of concepts, definitions, questionnaires, and tabulations as well as to the use of time-saving and economical survey procedures. In the United States, for example, the Current Population Survey is an important source of data on the demographic, social and related economic characteristics of the American population in addition to estimates of demographic change. (For more information about this program, see United Nations, 1979.)

Errors in Demographic Statistics. Demographic statistics, like other statistics collected through any data-collection system, will inevitably contain errors. A "perfect" census, civil registration, or survey is yet to be found. Nevertheless, birth, death, and other population data that are subject to errors can still be useful, if the extent of error present does not adversely affect the main use of the data. Therefore, any good data-collection system should contain, as an integral part, a program of data evaluation designed to estimate the accuracy of the main results and to identify the main sources and types of

error. Corrections and adjustment of errors may or may not be a component of the evaluation process, and they are not discussed here.

Two uses of the term "error" may be distinguished. First, in a narrow technical sense, the term may be used to refer to the extent that a statistic or an estimate departs from the value one is trying to measure or estimate, that is, the "true" value. Error defined in this way can, at least conceptually, be expressed in quantitative terms and is independent of how the data will be used. Second, the term can be used in a more practical sense to mean the extent to which one is misled by a statistic or estimate.

The second definition is the one most policy makers and administrators would wish to use, either explicitly or implicitly. It is a perfectly correct way to think about the issue, for it links the concept of error with the context in which data will be used. Unfortunately, some users having properly used a number in one context, use the same estimate for another purpose, forgetting that error so defined is less an attribute of the esitmate than of the particular purpose for which the data are used.

Demographers and statisticians have tended to emphasize the first meaning of error and so define the term as the difference between the value obtained by a given measurement and the "true" value one is trying to measure. It must be recognized that except in trivial circumstances, one rarely knows what the "true" value is. Therefore, demographers and statisticians are often only able to provide partial indications of the errors and uncertainties affecting the data.

As part of the effort to minimize the occurrence of errors and to take them into account in the use of data, a number of different categories have been developed to classify errors in meaningful ways. Common categories include (1) variable errors (frequently measured in terms of the "variance of an estimate") and bias, (2) sampling errors and nonsampling errors, and (3) coverage errors and content errors.

Variable errors occur as the result of purely haphazard events, such as why one set of units is included in a sample and another is not. The impact of errors of this sort may be reduced by increasing the number of units observed. A bias is an error that occurs consistently and may, therefore be particularly difficult to detect. When biases occur, they will usually not be identified by comparing results for similar groups because the results for each subgroup may all be wrong by the same amount. In a sample survey, biases cannot be removed or diminished simply by increasing the size of the sample. One example of relatively easily detected bias is the systematic heaping of age reports on certain preferred digits and ages frequently encountered in censuses and surveys when the simple question "How old are you?" is asked.

Errors having their origins in sampling can be subdivided into sampling variance and sampling biases. Sampling errors occur because the estimate of the universe parameter will not be exactly the same as the value of the universe parameter itself (the "true" value) simply because only part, and not all, of the units of the universe are covered in the estimate. Sampling biases may also arise from inadequate or faulty conduct of the designated-probability sample or from faulty procedures of estimation, for example, the kind of bias that is due to a systematic sampling. Nonsampling errors, which cover all types of errors that are unrelated to the fact that data are collected from a sample rather than the entire population, can also be subdivided into a variable category and a bias category. If survey or other data are based on a scientifically designed probability sample, it is possible to prepare estimates of the sampling variance which, in some cases, may also take into account the impact of nonsampling variable error.

In general, the estimation of sampling biases and nonsampling errors of all kinds is a more difficult task than the estimation of sampling variance. However, in any given situation, the possible impact of both sampling and nonsampling errors must be taken into account.

Finally, errors in demographic data are sometimes distinguished as to whether they are coverage errors or content errors. Coverage errors occur when there is undercounting or overcounting of total population, births, deaths, and so on for some parts of the population or in some geographic areas. In civil registration, generally underreporting or omission far exceed overreporting or duplication. In censuses and sample surveys, duplications may arise due to such factors as mobility of the individual or the household, but the overall tendency is toward omissions rather than duplications.

Content error refers to error in the characteristics reported for those persons or events that were counted. The misreporting of those aged 5 as aged 6, the reporting of a third-parity birth as a second-parity birth, the mistaking of a zero answer for a "not reported" or "unknown," which alter the nature of the data, are all content errors. However, the line between coverage and content errors is not always distinct and absolute. The undercount of those aged 0–4, which may result from a coverage error may also result from the misreporting of some aged 0–4 as aged 5–9, which is a content error. The resultant overcount for ages 5–9 thus may involve both content and coverage errors.

It is important to take due account of the errors that may affect any population data on which one wishes to

base policy or research conclusions. To do this, it is first necessary to attempt to estimate these errors; several methods are available for this purpose. With respect to nonsampling errors, two broad approaches are available for the assessment of error in demographic data. The first approach may be termed demographic analysis and is based on the examination of how closely an observed value comes to one or more estimates derived from related variables, usually on the basis of a simplified model of the demographic processes involved. [*Some of these methods are discussed in* INDIRECT ESTIMATION OF FERTILITY AND MORTALITY.] The second approach, often referred to as dual-collection estimation, involves the collection of information about the same events by two quasi-independent sources (for example, a survey and a civil registration system), the case-by-case matching of the events recorded in each system and the use of the match rates obtained to estimate the completeness of either or both sources. The same basic technique is used, with some modification, to estimate the completeness of birth registration or death registration or the coverage of a population census. (For more information on the dual system approach, see Marks et al., 1974; Krótki, 1978.) [*With respect to the estimation of sampling errors see* SAMPLING METHODS.]

Integrated Approach. Different data-collection systems can be made to coordinate and complement one another to provide a comprehensive source of statistical information for economic and social development planning, for administrative purposes, and for research, commercial, and other uses. The coordination can best be served if the relationships among all systems of investigations are consolidated at the planning stage of a statistical operation. A basic understanding of the purpose, plan, frequency, and duration of related investigations is essential.

The integrated approach requires that the concepts, definitions, and classifications used in all systems correspond as closely as possible to one another. In particular, common or at least compatible, approaches to age group classification, household and residence definitions, and urban-rural and other classification, as well as questions on family relationship and marital status, are of critical importance in the context of demographic analysis. Only after the integrated approach is adopted will the construction of a comprehensive data base capable of furnishing comparable statistical data be possible and meaningful.

Integration within a data collection system is just as important as between systems. Frequent revision of concepts, definitions, and classifications will result in confusion or at least noncomparability in data collected in different points of time and thus reduce their usefulness.

It is recognized that in some cases or sectors the inte-

grated approach may not be feasible or practical from a short-run point of view. Nevertheless the long-run advantage should outweigh any considerations of short-run difficulties. As the frequency and coverage in data collection will increase in response to the demand for more demographic, social, and economic data, integration in data collection becomes not only necessary but also inevitable.

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2.

INTERNATIONAL SYSTEMS

The Statistical Office of the United Nations has the major responsibility within the United Nations system for collecting and compiling international statistics covering a variety of topics, including population statistics. These population data are published annually in the *Demographic Yearbook* and quarterly in summary form in the *Population and Vital Statistics Report*. In addition, the data appear in other related Statistical Office publications and are shared with other organizations in the United Nations system and appear in some of their publications. These organizations include the International Labour Organisation (ILO), Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific, and Cultural Organization (UNESCO), World Health Organization (WHO), and the United Nations regional commissions for Europe (ECE), Asia and the Pacific (ESCAP), Latin America (ECLA), Africa (ECA) and Western Asia (ECWA), and other international organizations such as the World Bank.

Sources. The United Nations Statistical Office collects data directly from the various national statistical offices, primarily by means of an annual set of questionnaires. Data are also taken from official national statistical publications. These sources are supplemented by frequent correspondence with the national offices.

Each year every country or area of the world is sent questionnaires on which population estimates, vital statistics, international migration, and cause-of-death data are collected. In addition, after a country conducts a population census, two questionnaires are sent to collect census data on the general demographic characteristics and economic characteristics of the population. Countries are asked simultaneously to give information on the reliability of their vital statistics, the methods by which

they make population estimates, and the coverage and completeness of their population censuses.

Geographical coverage for the data collection is as complete as possible. For this reason the questionnaires for the *Demographic Yearbook* are sent to all countries or areas of the world regardless of whether or not they are independent states. The questionnaires are returned by the national statistical offices throughout the year, and the data are entered into the data base on a more or less continuous basis.

Major Publications. This data base is used to compile the *Demographic Yearbook* and the *Population and Vital Statistics Report*. The *Demographic Yearbook* presents general tables on population and vital statistics as well as special topic tables, the subjects of which rotate from year to year. *Population and Vital Statistics Report* includes only the most summary data and provides users with a more timely source of basic demographic data.

Demographic Yearbook. Population data published annually in the *Demographic Yearbook* include population census totals, midyear estimates of the total population and of the urban population for a ten-year period and, for the latest available year, population by five-year age groups, sex, and urban-rural residence, as well as the population of capital cities and cities of 100,000 and more inhabitants.

General tables presenting vital statistics data include, for a period of five years, the annual number of live births, deaths, infant deaths, late fetal deaths, marriages and divorces, and corresponding crude rates and ratios. More detailed data, shown only for the latest available year, include births by age of mother and sex and age-specific birth rates. Deaths and death rates by age and sex, infant deaths and infant death rates by age and sex, and deaths and death rates by cause are also shown for the latest available year. The most recent life expectancy values at specified ages by sex are also presented. In addition, maternal deaths, maternal mortality rates, and the number of legally induced abortions are presented for a ten-year period. Legally induced abortions by age of woman and number of previous live births are shown only for the latest available year. Marriages are presented by age of groom and bride for the latest available year. Data by urban-rural residence are presented for most of these tables.

The six regular *Demographic Yearbook* questionnaires provide data in far greater detail than can be published annually in the yearbook. These detailed data are presented as special-topic tables. The special topics, which have been featured periodically in the *Demographic Yearbook,* include fertility, mortality, marriage and divorce statistics, and population census statistics. For the first time in the history of the yearbook, the 1977 issue fea-

tured international migration, and to commemorate the publication's thirtieth anniversary the 1978 issue offered a Historical Supplement as the special topic, printed as a separate volume.

When fertility is the special topic, data on births by birth order, by age of father, and type (single, twin, or other), weight, and gestational age have been presented. Births by legitimacy status have been shown; detailed data have been presented for legitimate births including data by age of mother, age of father, birth order, and duration of marriage. Similar detailed information on fetal mortality has been presented to supplement the data on live births. In addition to these vital statistics data, census data on the female population by age, number of children born alive, and number of children living have also been shown. A table presenting selected derived measures has recently been added to the fertility issue. This table includes the child-woman ratio, the general fertility rate, and the gross and net reproduction rates.

In the mortality issue, detailed data on fetal, perinatal, and infant mortality have been shown, as well as detailed data on deaths by cause and marital status. Life table values presented have included expectation of life at specified ages, the number of survivors at specified ages, and life table mortality rates.

When marriage and divorce statistics are featured as the special topic, marriage rates by age of groom and bride and marriages by age and previous marital status have been presented, and a new table on first marriages has been added. Detailed data on divorce have included age of husband and wife, duration of marriage, and number of dependent children. Data on annulments are shown to supplement data on divorce. Census data on population by age, sex, and marital status and on household composition have also been included when marriage and divorce data are featured as the special topic. A selected derived-measure table on nuptiality and divorce has also been recently added. This table presents the proportion of those never married for selected ages by sex and the average annual marriage and divorce rates.

The detailed data on fertility, mortality, and marriage and divorce described above are published only when these subjects are presented as the special topic. The more basic data shown annually in the general tables also appear as special-topic tables, but for an expanded number of years. That is, the annual number of births, deaths, marriages and divorces, and corresponding crude rates are shown for a twenty-year period instead of the usual five-year period. Also, births by age of mother and sex and age-specific birth rates, deaths and death rates by age and sex, and marriages by age of bride and groom, are shown for a ten-year period rather than for the latest year only.

The issue featuring international migration presented data on departures and arrivals by major categories and detailed information on emigrants and immigrants, including country of last residence and of intended residence, respectively. Census data presented in this issue include information on foreign-born population by country of birth and population by country of citizenship.

Issues of the *Demographic Yearbook* featuring population census statistics have included information on population by single years of age and sex. Population of major civil divisions and population in localities by size-class, population by national or ethnic group, as well as information on literacy, educational attainment, and school attendance have been shown. Data have also been presented for the economic characteristics of the population. These included the economically active population by industry, occupation, and status; information on the female economically active population by marital status; and data on the not economically active population, by functional category. Census tables mentioned in connection with issues featuring fertility, marriage and divorce, and international migration also frequently have appeared when population census statistics are featured as the special topic.

The special Historical Supplement to the *Demographic Yearbook, 1978* includes thirty-year time series data. Census data included the total population by age, sex, and urban-rural residence, as well as urban definitions used for the various censuses. The percentage of urban population at each census was shown, as well as intercensal growth rates. Midyear estimates of total population were presented for the thirty-year period.

Data on fertility included the annual number of live births, crude birth rates, births by age of mother, and sex and age-specific birth rates for the thirty-year period. Census data on the number of children born alive and the number of children living and selected derived measures of natality were also presented for the same period. Mortality data included deaths and crude death rates, deaths and death rates by age and sex, and expectation of life for five selected ages for a thirty-year period. Data on marriage and divorce included selected derived measures of nuptiality and divorce and census data on population by age, sex, and marital status.

Population and Vital Statistics Report. Issued quarterly, *Population and Vital Statistics Report* presents the total population from the latest population census, the latest official estimate of the total midyear population, and an estimate of total midyear population for a recent reference year. Vital statistics shown include the total number of births, deaths, infant deaths, crude birth rates, crude death rates, and infant mortality rates. Indications of

quality of both the midyear population estimates for the reference year and the registration of births, deaths, and infant deaths are also presented. Estimated rates are used to supplement rates calculated using vital events wherever their registration is assessed as unreliable.

In the *Demographic Yearbook* and the issues of *Population and Vital Statistics Report,* official government statistics, taken either from questionnaires or from national publications, are supplemented by estimates prepared by the Population Division of the United Nations. Population Division estimates of the total population for individual calendar years, crude birth rates, crude death rates, and expectation of life at birth by sex for five-year periods frequently appear in these publications. The United Nations estimates of the total population are used either when official data are unavailable or to facilitate the presentation of time series data with as few breaks in the series as possible. Also, estimated crude birth and death rates are usually shown instead of rates calculated using registered birth and deaths when the country that provides the latter assesses them as unreliable, that is, as representing less than 90 percent of events occurring each year.

In the *Population and Vital Statistics Report* estimated rates are shown in addition to rates calculated using unreliable registered births and deaths. Other indicators, estimated by the Population Division, are used to supplement official data on fertility in the *Demographic Yearbook.* These include, for example, the child-woman ratio, the general fertility rate, and the gross and net reproduction rates.

Estimates prepared by the Population Division are based on official data collected by the Statistical Office of the United Nations and on other sources, as appropriate.

All data in the *Demographic Yearbook* are presented for individual countries or areas with the exception of two tables that present estimates for various regions and the world as a whole. These estimates include total population, crude birth rates, crude death rates, surface-area density, and population by broad age groups and sex. The estimates in these tables, with the exception of the surface area, are prepared by the Population Division of the United Nations.

Limitations. The demographic statistics published in the *Demographic Yearbook* and *Population and Vital Statistics Report* are subject to several different types of limitations, including problems related to the availability of data, the quality of data, and the international comparability of data.

Availability. Many countries are unable to provide the detailed demographic data requested on the questionnaires. Some countries can provide only estimates of the total population and a summary of the most basic vital

statistics, such as the total number of births and deaths. Others are able to provide estimated rates from sample surveys for individual years but very little annual data. Many countries are unable to provide data cross-classified by age and sex.

In the 1978 issue of the *Demographic Yearbook,* almost all of the 218 countries or areas could provide an official figure for the total population. In other words, most countries could provide at least either a census total or some official estimate of the midyear population within the past 10 years. For the same period, somewhat fewer countries, 164, could provide data on the population by age and sex. Of these, slightly more than half, 84 countries, could provide data further cross-classified by urban-rural residence.

In the same issue of the *Demographic Yearbook,* 125 countries could provide data on the total number of births for at least one year of the past five years while only 36 of these countries were able to provide births classified by urban-rural residence. For a corresponding period, 90 countries could provide live births by age of mother while, of these, only 58 could provide data further cross-classified by sex of infant.

Similarly, 129 countries were able to provide the total number of deaths for at least one of the past five years while only 40 of these were able to provide the total number of deaths classified by urban-rural residence. Deaths classified by cause-of-death for the corresponding five-year period were provided by 59 countries. Of the 118 countries that could provide the number of infant deaths for a recent five-year period only 79 could provide data on infant deaths by age and sex. The situation with respect to marriage statistics is similar. Some 121 countries could provide data on the annual number of marriages in the recent five-year-period while only 65 countries could provide data by age of groom and bride.

For some countries the available statistics are not national in coverage. In other words, data may be available only for certain ethnic or geographical segments of the population. In some cases these subnational data are published in the absence of national data.

Quality. One of the primary functions of the *Demographic Yearbook* is to publish as much official data as possible. However, since data vary in quality from one country or area to another, it is very important in publications such as the *Demographic Yearbook* and *Population and Vital Statistics Report* that readers be provided with information about the quality of population estimates and vital statistics data. Thus the annual questionnaires used by the Statistical Office in compiling the yearbook seek some basic information on the quality of the registration of vital statistics.

Countries are asked to give detailed information on the

method by which midyear estimates have been made. This information includes the base data, which may be a census or survey, and the method of time adjustment. The method of time adjustment may take into account fertility, mortality, and migration, although in some instances these are not taken into account and instead an assumed rate of increase is applied.

Information on the basis of the midyear estimates is published in the *Demographic Yearbook*. Estimates are classified as reliable or less reliable according to the base data and to the method of time adjustment. Data considered less reliable appear in italics as a warning to the user, as do less reliable estimates of population by age and sex. It should also be noted that estimates of population by age and sex, which are constructed by distributing the total estimated for a postcensal year proportionally according to the age-sex structure at the time of the census, are not published in the *Demographic Yearbook*.

On the vital statistics questionnaire, each country is asked to provide its assessment of the completeness of registration of births, deaths, infant deaths, marriages, divorces, and late fetal deaths. Furthermore, countries are asked to specify the basis of their estimates of registration completeness. The basis may be demographic analysis, dual-record check, or another method such as a population register. When vital statistics are published, data estimated to cover at least 90 percent of the events occurring each year are considered reliable while registered data covering less than 90 percent of the events occurring each year are considered unreliable and appear in italics. When countries do not provide information on completeness of registration of vital statistics, these data are automatically considered as being unreliable and appear in italics, as do rates and ratios calculated using these vital statistics.

Although the quality assessment is based on the registration of the total number of events, this assessment is also extended to apply to detailed data such as births classified by age of mother, deaths by marital status, and so forth. In some countries only birth and death registration are complete and, therefore, considered reliable. In very few countries is late fetal death registration complete.

International comparability. A major problem in the compilation, and indeed the analysis, of international demographic data is the lack of comparability from one country to another. The Statistical Office of the United Nations is responsible for developing and publishing recommendations for the taking of population censuses and for the collection of vital statistics. [*See* DATA COLLECTION, *article on* NATIONAL SYSTEMS.] These recommendations include the definition of census concepts and vital events as well as tabulation guidelines. The questionnaires used for the *Demographic Yearbook* reflect the United Nations recommendations.

Some examples can be cited of how variations in the methods of compiling national statistics can affect the international comparability of demographic statistics. An important problem in comparing census data is the practice of some countries to tabulate data for the *de facto* population while others tabulate data for the *de jure* population. These concepts correspond roughly to the population present at the time of the census and the population that is usually resident in the country, respectively. Strictly speaking, *de facto* and *de jure* populations are not comparable. In some countries there is a significant difference between the *de facto* and the *de jure* populations. Data shown in the *Demographic Yearbook* are for *de facto* population, unless otherwise indicated.

When taking a census, some countries use only the following categories for marital status: single, married, widowed, and divorced. They do not use the additional categories of separated and consensually married. These variations in practice make it not only difficult to compare data from one country to another but also difficult to calculate rates and other standardized derived measures requiring precise data on the marital status of the population.

More detailed census concepts and definitions provide an even greater source of variation from one country to another. For example, definitions of "household" used in the recent census round differ considerably from one country to another.

Because of the variety of national conditions and needs, the United Nations has not adopted specific recommendations regarding the definition of "urban areas." National definitions of "urban" and "rural," used in connection with population censuses, vary considerably. Not only is there a lack of comparability from one country to another, but also within the same country it is not uncommon that the definition of "urban" changes in successive censuses.

With regard to vital statistics, an important example of lack of comparability in the definition of vital events can be seen in the category of live births and fetal deaths. The World Health Organization definition, embodied in the United Nations recommendations, is that any birth is considered a live birth if it shows any evidence of life after being separated from the mother, regardless of gestational age. In some countries, however, only infants who survive for the first twenty-four hours, or who survive until their birth can be registered, are counted as live births. Infants dying earlier are counted as fetal deaths. In countries using these alternate definitions, the number of live births and infant deaths may be seriously underestimated. Fetal deaths will be overestimated as well. This

practice has important implications because rates calculated using a variety of definitions of live birth are not truly comparable. Infant mortality rates will be lower in countries not adhering to the internationally recommended definition than they would be if they used this definition.

The definitions used for marriage and divorce also present problems for international comparability. Unlike births and deaths, which are more easily defined because they are biological events, marriage and divorce are defined for statistical purposes in terms of the laws and customs of individual countries.

The comparability of vital statistics data is also affected by the practice of some countries of tabulating data by date of registration rather than by date of occurrence, as recommended by the United Nations. If almost all vital events were promptly reported, then the effect of this practice would be minimal. In some countries, however, registration, especially birth registration, may occur some years after the birth has taken place. Therefore, data on births tabulated by date of registration would not accurately reflect fertility for any given year.

In the *Demographic Yearbook,* United Nations–recommended definitions and classifications by age and other variables are used in the presentation of data and are explained in the Technical Notes for individual tables. Data deviating from international recommendations are indicated by footnotes, brackets, or other symbols, which appear on the tables. These and other problems are discussed in more detail in the Technical Notes.

Other Publications. The *Demographic Yearbook* and *Population and Vital Statistics Report* are prepared by the Demographic and Social Statistics Branch of the Statistical Office of the United Nations. Other publications of this branch include the *Compendium of Housing Statistics* and the *Compendium of Social Statistics.* Included in the *Compendium of Housing Statistics* is information on population density and recent data on city population and urban population, as well as projections for city and urban populations and a variety of data on housing conditions and amenities. These projections are prepared by the Population Division of the United Nations. The *Compendium of Social Statistics* is a compilation of social, economic, and related demographic data from all of the specialized agencies of the United Nations as well as the Population Division and the Statistical Office of the United Nations. Both English and French are used in certain publications.

Within the United Nations, the Population Division issues many publications of interest to those in the field of demography. Two of these, *World Population Trends and Prospects by Country, 1950–2000* and *Selected Demographic Indicators by Country, 1950–2000* are part of a continuing series revised periodically. These and other publications

of the Population Division are listed in the *Population Bulletin of the United Nations.*

The *Demographic Yearbook* is among a series of yearbooks published by the United Nations and its specialized agencies presenting data of interest to those in the population field. These yearbooks include, among other data described in detail in the *Directory of International Statistics,* information on the agricultural population in FAO's *Production Yearbook,* detailed data on the economically active population in ILO's *Yearbook of Labour Statistics,* information on education, literacy, and school attendance in the *UNESCO Statistical Yearbook,* and detailed cause-of-death data in WHO's *World Health Statistics Annual.*

<div align="right">Virginia Josephian</div>

For a related article on international data collection for research purposes, see WORLD FERTILITY SURVEY.

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3.
UNITED STATES CENSUS

Censuses were taken in antiquity in the Orient and in Europe, and as early as the seventeenth century in the New World. Some continued for decades or even centuries. The U.S. censuses, which began in 1790, are the longest modern series. Their results, moreover, unlike those of most of the ancient enumerations, are still readily available; not only the contemporary statistics but most of the original schedules (questionnaires) have been preserved.

A decennial census of population was required by the federal constitution for the purpose of apportioning seats in the House of Representatives and direct taxes among the states (Art. 1, Sect. 2). These head counts are also used for apportioning representatives in state and local legislative bodies. After a protracted debate, Congress authorized middecade censuses, beginning in 1985, not to be used, however, for congressional apportionment. That more frequent censuses were deemed necessary recognized the fact that other uses of the data have increased.

Several of the Founding Fathers, including Thomas Jefferson and James Madison, labored mightily to persuade the Congress to add items that would provide information on manpower, industrial composition, and national origins. These expansions came very slowly, however. The typical congressman of the period seemed to equate research with idle curiosity. The census of 1890, with its supplemental schedules, represented the peak in the number of items included; but the use of the data collected for administrative, business, and scholarly purposes continued to grow almost exponentially thereafter.

Changing Content. Beginning about 1950, the process of determining content, and such matters as tabulations, access to data files, and allocation of resources became the object of an elaborate network of advisory committees, public hearings, and correspondents. Participants included other public agencies, social scientists, business organizations, and, most recently, representatives of ethnic pressure groups. Efforts have also been made to conform to the recommendations of such international organizations as the United Nations Statistical Commission and the Inter-American Statistical Institute. As a result of this process and of the increasing complexity of census operations, the planning of a census has required increasingly more lead time so that the last 1970 reports had barely come from the printer before the formal planning of the 1980 census began. For about a century, each census was conducted by a staff recruited anew with a "census period" of typically three years. There was thus no organizational continuity from one census to the next.

The inefficiency of this arrangement was recognized fairly early, but it was not until 1902 that Congress was persuaded to set up a permanent Census Office. In addition to the decennial Census of Population, this new office (now a bureau) was also responsible for other national censuses (on such topics as manufacturers, agriculture, and housing), current sample surveys (beginning in the 1940s), and a variety of other statistical programs, all of which helped to smooth out the peaks and valleys in the agency's work force.

The questions contained in each census are given in several of the references. The broad topics, discussed in order below, are as follows: age and sex; residence; race and ethnic group; foreign stock; mobility; journey to work; economically active population; defective, dependent, and delinquent classes; military service; marital status and family groups; income and wealth; housing; education; and vital events.

Age and sex. In the first six censuses, only the head of the household was listed by name. Information on other members was obtained by what was essentially a tally. Thus, in 1790, the inquiries were limited to number of free white males of 16 years and up; free white females; slaves; other persons (free blacks and possibly Indians who paid taxes). Listing each person by name with his or her own characteristics was the great innovation of the census of 1850 under the leadership of its superintendent, J. B. D. DeBow.

It may be noted that sex was given in 1790 for whites only. Sex was first specified for slaves in 1820 and for "free colored persons" in 1830.

The number of age groups was gradually increased and by 1840 had reached thirteen for whites and six for other races. Age in years for all persons enumerated was called for in 1850 and thereafter. Age was specified (at first only in the separately printed instructions to the enumerators) as that at last birthday. (In the census of 1890 only, age at nearest birthday was substituted.) In the 1900 census, date of birth was also called for, and although this item demonstrably reduced the extent of heaping on favored ages (such as multiples of 5), it was not carried again until 1960.

Residence. Since few eighteenth-century Americans lived in homes with a street address, only meager geographic identification was attempted in the first censuses. Sometimes even the number of inhabitants of towns and villages was not segregated from that of the counties containing them. Address, in fact, was not recorded until 1880. This is not a tabulation item but is used to facilitate field callbacks and to reconstruct geographic detail that was not envisioned when the enumerators' maps were prepared.

Interest in the farm population led to the inclusion of a

question as to whether the family lived on a farm in 1930 and thereafter. Note that this question relates to farm residence and not to dependence on agriculture; and, in fact, the two counts appear to have increasingly diverged. The divergence would have been even greater had not the definition of a farm used in the census of agriculture been introduced into the population census in 1960 (before which time *no* definition had been employed) and had not the qualifying criteria for value of farm products sold been increased thereafter.

Race and ethnic group. Race was important to the federal and state governments since the constitution specified that only three-fifths of the slaves counted could be credited for apportionment purposes and Indians not taxed were not credited at all and indeed probably not even counted in early censuses. The category "slaves" disappeared in the 1870 census, the first one after Emancipation. The attorney-general determined in 1928 that all Indians were subject to taxation.

It has become customary to collect additional information for Indians roughly in alternate censuses—1880, 1890, 1910, 1930, 1950, and 1970, often by means of a Supplemental Schedule. Tribal affiliation, degree of blood, and ability to speak an Indian language are among the particulars examined.

The category "free colored persons" used in 1820 presumably referred to blacks, since there was a residual category for "all other persons, except Indians not taxed." There were two "line-type" schedules in 1850, one for free inhabitants and one for slaves. On each there was a question on color, specifying the categories "white, black, and mulatto." The rather unsuccessful attempt to identify persons of mixed white and black ancestry persisted intermittently until 1920; indeed, the categories "quadroon" and "octoroon" were added in 1890. Chinese and Indians were first shown separately in 1870; and Japanese in 1890. Beginning with the 1900 census, there was a space for write-in entries for other categories, and thus the numbers of Asiatic Indians, Koreans, Pacific Islanders, and other racial categories could be determined from a hand tally. Eskimos were identified in Alaska only, and Hawaiians and part-Hawaiians in Hawaii only. As the Census Bureau has stated, "The concept of race, as it has been used by the Bureau of the Census, is derived from that which is accepted by the general public. It does not reflect clear-cut definition of biological stock, and several categories obviously refer to national origin." For most censuses, the entry was based on the enumerator's observation with questions being asked only in some doubtful cases. With the advent of self-enumeration in 1960, "race" has become essentially a matter of self-identification.

The identification of more specific ethnic groups was largely a part of the inventory of the foreign stock. The interest in Mexican-Americans and recently in the entire population of Hispanic or part-Hispanic origin transcends this framework, however. In the census of 1930, only, there was a quasi-racial category "Mexican." This was dropped, and attempts to identify Mexican-Americans in the Southwest from the questions on birthplace, Spanish mother tongue, or Spanish surname were substituted. At the urging of leaders of the Hispanic peoples in 1970, a 5 percent sample of the population was asked whether it was of "Spanish descent"; and in 1980 this was broadened to "Is this person of Spanish/Hispanic origin or descent?" with four positive categories. There was also a question: "What is this person's ancestry?" This last question is similar to the one on origin in the census of Canada, which lacks both reliability and validity according to some critics.

Foreign stock. There has always been some concern about the foreign-born on the part of native Americans, but this concern was particularly intense and widespread early in the twentieth century when eastern and southern Europeans arrived in record numbers. The volume and character of immigration from abroad have been reflected in the attention paid to the foreign stock in the census schedule. Subsequent concern about illegal immigrants has proved to be more difficult to implement in this regard.

The 1820 and 1830 censuses asked for the number of foreigners not naturalized in each household. The 1850 census included a question on country of birth for each foreign-born person and state of birth for each native. This question has been repeated at each succeeding census. The 1870 census added a question on nativity of each parent, thus adding the identification of second-generation Americans to the foreign stock. By 1880 the question on birthplace of parents was made more specific by asking for countries of birth of foreign-born parents, but a century later this attention to "parentage" was dropped altogether. The 1890 census added two more questions for the foreign-born—citizenship again and duration of residence in the United States. The topic of citizenship in more or less detail has thus been in (1820, 1830, 1870, 1890–1950, 1970, and 1980) or out of the census, but it has always been limited to whether or not the person was a citizen of the United States rather than specifying the country of citizenship for the foreign-born. "Duration of residence" became "year of immigration" from 1900 to 1930, in which form it reappeared in 1970. Finally, questions on language spoken began with "ability to speak English" (1890 to 1930 in continental United States, and thereafter in some outlying areas, such as Puerto Rico). This question finally reappeared in 1980 but then also with an indication of how well English is spoken. Mother

tongue or some equivalent was included in 1910 to 1940 and 1960 to 1980, the coverage being variously foreign white stock, foreign-born white, white population, foreign-born, or the total population.

Mobility. The question on place of birth, introduced in 1850, provides information on interstate migration as well as on immigration and nationality. Questions on residence at a fixed past date, to supplement this information on lifetime migration, were first introduced in 1940. The scope of these questions extended to intrastate migration and intracounty mobility. The migration interval was five years, except in 1950 when it was only one year. Questions on activity five years ago, first introduced in 1970, provided parallel information on social mobility. Furthermore, the Housing Census of 1960 and thereafter contained a question on length of residence at present address for the head of the household. (The Housing Census has always been taken concurrently with the Population Census; for some decades this relationship was also true of the Census of Agriculture.)

Journey to work. Inquiries on commuting by workers first made their appearance much later in the Population Census. The 1960 census had a pair of questions on place of work and means of transportation to work. Subsequent expansions have included more detail on geographic location, time required to get to work, and car pooling.

Economically active population. One of the first items to be added to the census schedule was the number of persons in the family engaged in agriculture, commerce, and manufactures. From this modest beginning, inquiries into the economically active population have grown to represent a main part of the space on what is now the "Long Form." This emphasis reflects the great demand for ever more detailed data on the part of government, business, manpower planners, vocational advisers, and economists and other social scientists.

In 1840 there were six classes of industry and one of occupation. The individual line schedule of 1850 had a column for "occupation" only. Occupation has been called for ever since, but it was coupled with industry and class of worker in 1910 and thereafter. Meanwhile, the number of months unemployed was added in 1880, and again in 1890 and 1900 (months *not employed* in the last year). The 1910 variant was "If an employee, whether out of work on the census day, and number of weeks out of work during the preceding year." The war-induced prosperity in effect when the 1920 census was planned may have persuaded the authorities to dispense with such an item, but in 1930, a depression year, "whether at work previous day (or last regular working day)" was asked of gainful workers, that is, those who had an occupation. Moreover, there was a supplemental schedule for gainful

workers not at work on the day preceding the enumeration.

A major watershed in the inventory of the economically active occurred in 1940. At that time the Works Progress Administration was pioneering with a national sample survey, the Monthly Report on the Labor Force. This survey recognized the gross inadequacies in the decennial inventory of gainful workers, a concept that had evolved in the United States and abroad during the nineteenth century. The gainful-worker concept referred to the person's usual activity but had no particular time reference. It included many retired persons as gainful workers but omitted persons seeking work for the first time and was particularly inadequate in measuring unemployment, which was a preeminent economic problem in 1940.

The labor-force concept, on the other hand, counts the economically active in a reference week, which could be the week preceding the interview or the week preceding the census date. Persons 14 years and over (16 and over since 1970) are classified into two major groups:

1. Employed
   a. at work in the reference week for one hour or more
   b. with a job but not at work
2. Looking for work (unemployed)

These two groups constitute the labor force. Persons in neither group (such as housewives, students, the disabled, and the retired) are not in the labor force. It is important to note the hierarchical principle in this classification. In case of multiple activities, subgroup 1a takes precedence over subgroup 1b, which takes precedence over group 2. This approach has now diffused to many other industrialized countries.

The actual questions on the economically active population have tended to proliferate as the labor force is examined in more detail. Concern about unemployment and underemployment in 1940 occasioned questions on employment in public-emergency work, number of hours worked in the reference week, and duration of unemployment. The additional 1950 questions were weeks worked last year (mainly to supplement the questions on earned income); if looking for work, number of weeks; and, for persons not in the current labor force who nevertheless worked last year, occupation, industry, and class of worker of last job. Hours worked was restored in 1960, and there was a new question on year last worked. The 1970 questions depended somewhat upon the particular sample in which the household fell (see following), but most labor-force questions applied to the full 20 percent sample. The questions on activity and on occupation and so on five years ago—mentioned under mobility—were

confined to the subsamples. The 1980 census saw a further proliferation but only in minor details. It should be emphasized that occupation, industry, and class of worker all apply to the same job and that all three must be specified.

Defective, dependent, and delinquent classes. This phrase "defective, dependent, and delinquent classes" from texts on social pathology of a generation ago harmonizes with the terms and concepts used in mid-nineteenth-century censuses, but more recent items are confined to health problems. Supplemental schedules in 1850 and 1860 dealt with public paupers and criminals. Prisoners were also included in 1870, when the main schedule asked of each person "whether deaf and dumb, blind, insane, or idiotic." The 1880 census was concerned even more with such problem classes, using both types of schedules and adding questions on sickness and disability (including blindness) within the context of inability to attend to ordinary business or duties on the day of the interview. Further particulars were gathered on the supplementary schedule, which also inventoried homeless children. As for so many other topics, the scope of these inquiries peaked in 1890. For example, for those suffering from an acute or chronic disease, the name of the disease was to be entered as well as the length of time afflicted. Inmates of benevolent institutions also rated a special schedule. Thereafter came a recognition that some of these problems were perhaps better studied through some source other than the decennial census, but inquiries of this nature persisted on a decreasing scale through 1930. In 1970 health agencies and allied interests managed to secure the introduction of an item on presence and duration of a disability (type not specified) that limits the kind or amount of work the person can do at a job. This item was confined to the 5 percent sample. The single 1980 item on disability was somewhat more detailed and was concerned with ability to use public transportation as well as to work.

Military service. Pensioners for the Revolutionary War or other military service were listed in 1840. Ex-servicemen of the Civil War or their widows were listed in 1890, as were the former in 1910. Veterans of any war or service were listed in 1930, and this inquiry has continued through 1980, with the war or other service being specified. Moreover, for a number of censuses ending in that of 1930, the number of males of militia age was published.

Marital status and family groups. Marital status of persons 15 (or 14) years old and over was not included on the population census schedule until 1880, but it has been carried in every subsequent census with only a slight expansion in the number of categories. The rudiments of marital histories began in 1900 with a question on number of years married. Essentially, this question has been continued in every subsequent census, although the form has varied (years of present marriage, age at first marriage, duration of present marital status). Since 1950 there has been a question on whether married more than once, which was supplemented by an inquiry as to whether the first marriage ended by death or divorce. (See also under the heading "Vital Events," below.)

The very first census called for the name of the head of the household (then called "family"), but it was not until 1880 again that the relationship of each household member to the head was called for. This information facilitated the assembling of members into groups such as primary families, secondary families, subfamilies, and married couples. (At the insistence of feminists, the concept "head of household" was replaced in 1980 by "reference person," but it is hoped that the same groups can be identified under the new procedure. The determination of the number and characteristics of these groups (such as size and characteristics of head) depends more upon data processing than upon schedule content, however. The first published statistics on households appeared in 1890 and those on families in 1950.

Interest in the institutional population was reflected in the 1850 listings of paupers and convicts. Similar categories are reflected in the account above of the defective, delinquent, and dependent groups. What is now called "the population in group quarters" comprises not only the institutional population but also persons in college dormitories, boarding houses, residential hotels, military and naval bases, crews of vessels, labor camps, and the like.

Income and wealth. Since property taxes long preceded income taxes as a source of government revenue, Congress, which specified schedule content for the earlier censuses, called for a question about value of real estate as early as 1850. To this was added the value of personal estate in both 1860 and 1870. The initial, rather timid, attempt to secure particulars on income occurred in 1940 and was confined essentially to wage and salary income. (The Social Security system had begun in 1935, and the Social Security number was also asked for in 1940 as well as whether deductions were made from wages or salary.) Reassured by this experience with the income question, the Bureau of the Census went on in 1950 to inquire about self-employment and unearned income. The categories of this last have become progressively more detailed with particular attention being paid to transfer payments.

Housing. Closely related to the item on wealth were the items that foreshadowed the housing census. Tenure of home and of farm and whether an owned home or farm was mortgaged made their appearance in 1890 and again

in 1910. In 1930, in addition to these items, were questions on the value of an owned home or monthly rental and whether there was a radio set in the home. The first full-fledged census of housing in 1940 contained these items and many more. A number of housing items have been of demographic interest. In regard to others, it is hard to tell whether the principal purpose was to describe the household's level of living or to indicate potential markets for various consumer durables.

Education. The first question on education was a simple one on literacy in 1850, which continued through 1930. There was never any test of the claim that the respondent could read and write. Although literacy still remains on the list of census items endorsed by the United Nations Statistical Commission, the United States replaced it in 1940 with a much more informative item on educational attainment. School (or college) attendance appeared in 1880 and had its centenary in 1980. In the first two of these censuses, the number of months attended during the year was also asked. Since 1960, attendance at public schools or college has been distinguished from that at private ones; indeed the latter category now is separated into religious and secular private schools. Ability to speak English was included from 1890 to 1930 and again in 1980.

Vital events. As compared with other Western nations, the United States was relatively late in establishing a national registration system of vital statistics. Efforts were made, however, to compensate for this lack by asking households in the census how many vital events of a specified nature had taken place in the previous year. Supplemental schedules from 1850 through 1890 were devoted to those who had died during the year. Statistics on births could be derived from the age data supplemented by reported infant deaths. On the regular schedule from 1860 to 1890, each person was asked whether he or she had been married within the year. In addition the month of this marriage was asked for in 1870. These listings were never very complete, and they gave way to more effective state registration systems and the institution of Registration Areas by the Bureau of the Census. National Coordination of vital statistics was transferred to the Public Health Service in 1946.

Questions on fertility in the census are those on the number of children ever born to females age 15 (or 14) and over. In 1890, 1900, and 1910 the number of these children now living was also on the schedule. Because of low priority and lack of funds, none of these data were ever officially tabulated, except that when the children-ever-born item was resumed in 1940, a sample of the 1910 data was also tabulated and published. This item yields information on fertility that cannot be obtained from vital statistics.

Geographic Coverage. In general, the census enumeration followed the advancing frontier in states or territories, although it omitted Indian reservations until 1890. With the advent of an American empire, the census was extended to outlying territories and possessions. Alaska was first included in 1880; the Philippine Islands, Puerto Rico, Hawaii, Guam, and American Samoa in 1900; the Canal Zone and Midway in 1910; the Virgin Islands in 1920; certain small Pacific and Carribean islands in 1940; and the Trust Territory of the Pacific Islands in 1950. The Philippines were no longer covered after their independence in 1946. Census schedules were similar to those in the coterminous United States but with changes to reflect local situations, including degree of literacy.

Attempts were made as early as 1900 to enumerate Americans living in foreign countries through counts (not listings) provided by U.S. embassies and other agents. Formal schedules were first introduced for such persons in the census of 1950. The groups covered are armed forces, federal civilian employees, dependents of these groups, crews of merchant vessels, and other citizens (such as businessmen, employees of international organizations, retired persons, missionaries, and students). The coverage of this last group is deemed relatively incomplete. Special census reports on Americans living abroad were published in 1950 and thereafter.

Legislation. The broad mandate for the census in the U.S. Constitution has been implemented by a number of acts of Congress. Indeed, until 1930 the content of the census schedule was specified or at least reviewed by Congress. Since then this authority has rested with the director of the Bureau of the Census, subject to the approval of the secretary of commerce. Congress, of course, reserves the right to intervene, and there were persistent but unsuccessful efforts in the late 1960s to make replies voluntary to all but a few items in the 1970 census. The Permanent Census Act of March 1902 was an important measure. Title 13 of the United States Code dates from 1954 and has been amended several times since then. It deals with such matters as the confidentiality of census data, duties of the director, the hiring of temporary employees, censuses and surveys to be conducted, geographic scope of the censuses, and penalties for disclosure of information and for refusal to answer questions.

Planning. The time required for planning of the population census has grown rapidly in recent decades. For the 1980 census, serious activity began in 1974. In addition to in-house discussions and advisory committee sessions since that date, there were more than seventy public meetings, ten content and method tests, four pretest censuses, and three dress rehearsals. Since this twentieth decennial census was to cost about $1 billion and was to

guide the distribution of $50 billion in federal funds to state and local governments in addition to its other important uses, the need for careful planning of such an enormous undertaking was evident. Most of the census operations and even the outlines of most publication tables were in readiness before enumeration began on 1 April.

Collecting the Data. Collection procedures include the preparation of enumerators' maps, the preparation of data-collection and field-control forms, and the fieldwork itself. All of these procedures evolved from very simple beginnings to complex systems.

Geographic work. Until 1880, the enumerators seem to have been given no maps at all. Nowadays the Geography Division works from a wide variety of map materials so as to be able to delineate up-to-date boundaries of political areas and such purely statistical areas as urbanized areas and census tracts. The thousands of annexations to incorporated places that occur during a decade must be taken into account also. No Enumeration District (E.D.) may be located in more than one geographic area. Ordinarily, each enumerator is assigned one E.D., but he or she may have a second assignment after completing the first. Recent developments in address registers stored on electronic tape give the bureau great flexibility in establishing population counts for new types of areas as they are requested.

The bureau has had a prime role in the delineation of regions, geographic divisions, urbanized areas, and unincorporated places. It has worked with other federal agencies in the definition of metropolitan areas and with local committees in the setting up of census tracts.

Census data are assembled for geographic areas of different sizes, such as combinations of states to form geographic divisions and regions, economic subregions that may cut across state lines, state economic areas within states, and census county divisions. The standard metropolitan statistical area (SMSA) includes one or more economically and socially integrated counties with at least one city of 50,000 or more inhabitants, or two contiguous cities with a joint total that is at least that size. In addition to the criteria of population size and integration, SMSA's must be generally metropolitan in character as determined by population density and proportion of the labor force that is nonagricultural.

The urban census tract is a statistical division of the metropolitan areas delineated in order to show the distribution of the population within the city and its suburbs as well as the characteristics of tract inhabitants. Most tracts have a population between 3,000 and 6,000 and are fairly homogeneous with respect to social and economic conditions. Tract boundaries are relatively permanent. In cities of 50,000 or more at the previous census, city blocks are numbered and statistics and analytical maps are published using the block as the unit.

Fieldwork. For almost one hundred years, the census questionnaires were filled by U.S. marshals and their assistants acting *ex officio*. Special census agents were first appointed in 1880. The nature of the enumerators' work has changed radically since the interviewer method has largely given way to self-enumeration with use of the mails, beginning in 1960. Since the creation of the permanent Census Office in 1902, the bureau has had a permanent field staff, which is responsible for overseeing sample surveys and establishment censuses as well as household censuses. For the taking of a national census, this relatively small cadre is supplemented by the hiring of thousands of temporary employees, who fill such positions as district supervisor, technical assistant, crew leader, enumerator, and office clerk. Characteristically, these have been political appointees in varying proportions, or, as they are euphemistically called, appointments by the "referral system." In times of high unemployment such as 1930, even the lowliest of these jobs may have represented plums, but in times of relatively full employment and high wage levels the influence of political organizations can be very useful in persuading reluctant candidates to apply. In modern times, enumerators have been typically housewives and others without full-time jobs. In all cases qualifying tests must be passed.

The census enumerates people where they actually live on the basis of "usual residence," which more closely approximates the *de jure* than *de facto* principle. This practice creates some difficulties in the case of a protracted enumeration, but fortunately the time required for the fieldwork has tended to decrease. In 1970, 60 percent of the district offices using the mail out–mail back procedure were closed within two months of the census date; the last office closed on 30 June. Official state totals have to be transmitted to the president by 1 January after the census, for apportionment purposes. Occasional subsequent corrections have no effect on apportionment but are footnoted in census publications.

A wide variety of forms is used in the fieldwork. These are of two types—data-collection forms and control forms. In addition to the short (complete-count items only) and long (plus sample items) schedules of the 1980 census, there were the Individual Census Report form, schedules for outlying areas, and a few others. Many different types of control forms are used to transmit materials down and up the chain of command and for progress reports. Altogether, 156 million forms of all types were used in 1980.

In the 1980 census, as in 1970, the Bureau of the Census made use of an address list that had been carefully checked by several independent procedures. This covered

about 86 million housing units, some of which were vacant on census day. The schedules were mailed to these addresses a few days before 1 April. The household had the responsibility of filling out the form and mailing it back. By personal visit or telephone enumerators then followed up those schedules not received in several weeks or schedules that did not meet prescribed standards of completeness. The one-tenth of the population living in open-country areas were covered by the traditional interviews. There were special procedures ("T-night," "M-night," "Casual Count") for transients and persons without fixed addresses.

Sampling. The collection of about ten items from a 5 percent representative sample of the population was one of the main innovations in the 1940 census. This experiment having proven itself in the face of considerable scepticism, the use of sampling was greatly extended in subsequent censuses until in 1980 only five items (relationship, sex, race, date of birth, marital status, and Spanish origin) remained on the complete-count (short) questionnaire. The 1940 census sampled persons. Subsequent censuses have sampled households, a superior basis for many purposes. In 1950 and 1970, two different sampling ratios were used for different groups of questions. In most areas one-sixth of the households received the long form in 1980, but in communities with a population of less than 2,500 this fraction was increased to one half to increase the reliability of estimates for such communities for revenue sharing and other matters.

In addition to its use in the collection of population data, sampling has a number of other important uses. For example, it is used in the verification of the work of enumerators and of office coders, in tabulations to sample or subsample larger data sets, as for preliminary reports, and in designing the follow-up studies.

Processing and Tabulation. A modern census includes a number of office operations prior to the release of publications or of data in some other forms. Such operations include receipt and control, coding and editing, transference of data to the tabulator, tabulation and review thereof, and table preparation. Until 1890 tabulations were mostly prepared by hand tallying, a notoriously slow and untrustworthy procedure in mass operations. Working first at the Census Bureau, and later in private industry, Herman Hollerith developed a tabulating machine, which was used in the censuses of 1890 through 1910. The "unit counter" was designed in the bureau's own machine shop and, with continuing improvements, was used through the census of 1950. Input was in the form of punched cards. To meet needs that commercial manufacturers were not then capable of meeting, the Census Bureau with the help of the National Bureau of Standards led the way in introducing electronic equip-

ment to tabulation processes. The Universal Automatic Computer (UNIVAC) computer system was delivered to the bureau in 1951 in time to tabulate the 1950 data for only four states. Subsequently, such allied equipment as a high-speed printer and the Film Optical Scanning Device for Input to Computers (FOSDIC) was introduced. Significant advances were also made in programming methods. Since 1960 practically all census tabulations have been made on electronic computers.

Items collected from 100 percent of the population ("short form") are precoded, and this material, including the vital total counts, can be processed and released relatively promptly. Some of the sample items are also precoded, but such items as residence five years ago, place of work, occupation, and industry, with a great many response categories, require hand coding. A great deal of the editing is now also performed in the computer.

Publication and Other Forms of Dissemination. Although early census reports were in the form of bound volumes with statistical tables and text, they were addressed to Congress in a covering letter from the superintendent. This formality has long since been dispensed with. The number and complexity of the reports have tended to increase over the years but not monotonically. The 1890 and 1910 censuses with their many supplementary inquiries produced long shelves of volumes. These programs led to many complaints about the delay in releasing the statistics. Indeed, delay has been a continuing problem, although improvements have been made through earlier preparatory work; the use of sampling in verification, mechanical and electronic equipment; press releases; and advance reports. Publication tables in the first part of this century were hand-posted from machine sheets turned out by the unit counter. Now the high-speed printer turns out pages for publication copy. Mechanical equipment permitted more cross-classification of characteristics in tables, and electronic computers make it easy to incorporate derived figures, such as percentages and averages. Even charts and maps may now be produced electronically. The bureau is required to send all regular publications to the printer within the three-year census period.

The last few censuses have not only continued the trend toward more cross-classifications, but they have also devoted increasing numbers of pages to inventory-type statistics for small areas (census tracts, blocks, and others), for which public demand is very great. In 1970, 200,000 pages of reports were printed. The estimated total for 1980 was 250,000, but this number is likely to be reduced considerably because the cost of field operations greatly exceeded the budgeted amount. Both include information on housing as well as on population. The basic outline consists of four series of state reports, joint tract

and block reports for population and housing (essentially for metropolitan areas), and about forty subject reports and specialized area reports. The time schedule prevents including very much evaluation or interpretation of the statistics in the basic reports, but there are methodological reports on operations and experiments, climaxed by a procedural history. In 1920, 1950, and 1960, there were series of analytical census monographs, some by outside authors. For 1980 some of the lost publication tables will be replaced by microfiche.

For some decades the public has been able to purchase copies of tabulated but unpublished statistics, to contract for special tabulations, and to purchase summary cards giving tally totals. Beginning in 1960, the public was allowed to buy sample data files in which, however, individual identifying information is suppressed. This breakthrough was greatly expanded in 1970. Moreover, the original census schedules or microfilms thereof, which are stored at the National Archives, are open to public inspection for years up to 1900 and have been widely utilized by genealogists and increasingly by social scientists.

Problems of Quality. Census quality concerns completeness of coverage, the accuracy of reported characteristics, nonresponse, sampling error, and sampling bias. The first of these has become the main focus of concern.

Coverage errors include undercounts and overcounts. The latter, which arise through double counting or falsification, are generally of minor importance. Although adequate gauges are lacking, every census has undoubtedly suffered from net undercount. President Washington, observing the 1790 census, was concerned by its slow progress (more than a year) in some districts and was convinced that the true population was over rather than under 4 million. Census officials a decade or so after the Reconstruction census of 1870 suggested a rough correction for undercount in the South. Yet the director of the 1920 census claimed that nobody was missed! By the 1950s demographers at Princeton University and the Census Bureau were estimating the net undercount by analytical methods. These efforts were supplemented by more expensive Postenumeration Surveys and matching studies to estimate gross errors and types of error.

Net undercount may have declined slightly from 1950 to 1970. The preferred figure for 1970 is 2.5 percent. Unfortunately, that percentage varied widely among geographic areas and especially among population subgroups. For example the estimate of undercount for black males aged 25 to 29 is 18.5 percent. But the cost of obtaining reliable estimates in further detail tends to increase exponentially. The same is true of the cost of reducing the 2.5 percent toward zero. The latter problem lies not just in census field procedures, but also in the increasing difficulties of reaching a mobile population, some of whom have no fixed place of address and some of whom are indifferent to the census efforts or even hostile to them.

The irony is that many of the leaders of minority groups that are relatively difficult to enumerate now attack the bureau for not achieving a complete count of their group. The stakes in apportionment, in political power, in revenue sharing, and in other federal grants are now so high that the size of a population count for an ethnic group or a political area has acquired great competitive significance.

In addition to spending more money on measuring the undercount, the bureau in 1970 and even more in 1980 spent vast sums to try to reduce it. About one-quarter of the billion dollar cost of the 1980 census was spent for such purposes. The Minority Statistics Program, the Community Services Program, and the Local Review Program were among the new efforts in this endeavor. A critical issue is whether to adjust the census counts to correct for the undercount and, if so, in how much detail and for what purposes.

<div align="right">Henry S. Shryock, Jr.</div>

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DATA FILES, MACHINE-READABLE

See MACHINE-READABLE DATA FILES.

DATA SOURCES

See Data collection; Machine-readable data files.

DEATH

See Mortality.

DEATH RATES

See Rates and ratios.

DEMOGRAPHIC TRANSITION THEORY

The demographic transition theory describes the changes that take place in birth and death rates as a population passes from traditional, or premodern, social and economic conditions to an urbanized and industrialized modern society. The term was first used by Frank W. Notestein in 1945 in reference to the demographic history of Western Europe, but it has since been applied to the actual or predicted experiences of developing countries as well.

The theory is based on two observations: (1) that fertility and mortality are high in traditional societies and low in modern societies and (2) that every modern society has passed from high to low rates. There is no single explanation for this uniformity of change, for it does not occur in the same way in every country or region.

Originally the phenomenon was thought to occur in three stages: (1) a balanced stage, of high potential growth, when both birth rates and death rates are high; (2) a transitional stage of rapid growth when death rates fall but birth rates continue at a high level; and (3) a new balanced stage when both birth rates and death rates are low, with the potential for a dwindling population. However, subsequent research showed stage 2 to be misstated, since fertility sometimes fell simultaneously with, or occasionally even before, mortality. Moreover, difficulties arose in tying the transitions in different areas to any consistent set of social or economic changes.

Nevertheless, the broad pattern of a decline from high to low vital rates clearly occurred in every modernized society. A second generalization also holds true. In the developing countries mortality has fallen much faster than it did in Europe, producing a stage of very rapid population growth.
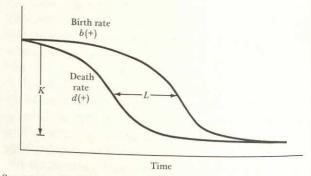
Nathan Keyfitz (1977) has provided a method to calculate the difference to the ultimate population size of a given delay in the fall of the birth curve. Figure 1 shows the descent of death rates, $d(t)$, and of birth rates, $b(t)$.

The curves coincide at beginning and end so that zero growth prevails both before and after the transition. The ratio of increase in the total population size in the time interval dt between the initial and final stationary conditions, is the exponential of the area A between them. That is, for $\int_0^T [b(t) - d(t)]dt = A$, the ratio of increase in the population is simply e^A.

Figure 1 is a special case in that the birth and death curves have the same general shape as well as the same starting and ending levels. The fall in the birth rate lags by L behind the death rate, and both drop by K over the transition. The area A is equal to K multiplied by L, and the ratio of increase in the population size is e^{KL}. Without taking into account the momentum of population growth due to age distribution, this calculation gives an increase in the ratio of $e^{(0.02)(30)} = 1.82$ if K, the common decline of births and deaths, is 0.02 (e.g., from 40 per 1,000 to 20) and L, the lag, is 30 years. Thus, the population would grow by 82 percent before stabilizing at its new level.

The strength of the demographic transition theory lies in the root fact that, with sufficient modernization, fertility and mortality finally change in a predictable manner. It does not tell what type or degree of modernization is necessary to produce a fertility decline, and it cannot reliably identify a population in which fertility will fall at a specified time. Current studies of thresholds to fertility decline are based on the hypothesis that there are one or more associated socioeconomic variables that, when they reach certain critical values, trigger a fall in fertility. Variables such as education, income distribution, urbanization, or mass-media use may constitute a threshold pattern in one situation, while a combination of different variables may bring about the same result in another country or social class. Attempts have been made to allow for cultural differences in different parts of the world by defining thresholds according to regions, and to allow for the evolution of the global cultural environ-

FIGURE 1. *Stylized form of transition from high to low birth and death rates*

Time

Source: Keyfitz, 1977, p. 24; reprinted by permission.

ment by using moving thresholds. These represent modifications of the demographic transition theory to improve its applicability in different periods of history and to improve its capacity to predict changes in societies that are not yet in low fertility–low mortality balance.

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See also ECOLOGY; EPIDEMIOLOGIC TRANSITION, *article on* THEORY; FERTILITY DECLINE.

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DEMOGRAPHY

Demography, in the most precise sense of the term, is the quantitative study of human populations and the changes in them that result from births, deaths, and migrations. Inhabitants of given geographical areas and their political subdivisions are the groups most often studied by demographers, but subclassification by particular characteristics such as age, sex, or urban and rural residence is a common procedure.

Collection and statistical analysis of data on fertility, nuptiality, migration, and mortality form the core activities of formal or pure demography, although the field has greatly expanded in recent years. When biological, social, economic, legal, and historical determinants of change in populations are examined, and when the interactions of demographic processes with social relationships and natural resources are explored and predicted, the discipline is usually termed "population studies." Demographic research then takes on a multidisciplinary character and certain specializations are given names such as "economic demography" or "historical demography." The distinction between strictly demographic investigation and the broader field of population studies is based on

whether the focus is on mathematical or statistical analysis of the nature and interaction of the components of population change or, using the theories and methods of other disciplines, on study of the relationships among those components and other variables.

DEVELOPED COUNTRIES

The term "developed countries" is used to discuss industrialized countries, both "industrial market economy" countries and "nonmarket industrial economy" countries, as these terms are used by the World Bank. The terms "Western" countries and "Eastern" countries are sometimes used to describe various industrialized countries.

Numerous entries throughout this work are devoted to population phenomena in developed countries. Pertinent country and regional entries include CANADA, EUROPE, JAPAN, SOVIET UNION, and UNITED STATES. Information on Australia and New Zealand appears in the entry OCEANIA. Reference to additional entries that focus mainly or exclusively on the United States may be found in the summary entry UNITED STATES. Under URBANIZATION, the article on DEVELOPED COUNTRIES, as its title implies, is limited to a discussion of urbanization in these countries. Many other entries—such as those on ABORTION, article on INDUCED ABORTION; ADOLESCENT FERTILITY; EDUCATION; FERTILITY AND POPULATION GROWTH; INTERNATIONAL MIGRATION; LAW AND FERTILITY REGULATION; article on WORLDWIDE PERSPECTIVES; and PUBLIC HEALTH—deal with both developed and developing countries.

DEVELOPING COUNTRIES

The term "developing countries" is used broadly to discuss nonindustrialized low-income, and usually middle-income, countries. Capital-surplus oil-exporting countries are often included in this group as well. In some articles in this work, the term is more explicitly defined; in others such broad terms as "the Third World" are used in reference to developing countries.

Articles on selected aspects of population in developing countries can be found under the headings CONTRACEPTIVE USE; FAMILY PLANNING PROGRAMS; and URBANIZATION. Numerous other articles are also devoted principally to developing countries. These include AGE AT

MARRIAGE; BREASTFEEDING; FAMILY PLANNING PROGRAMS, article on NONCLINICAL PROGRAMS; FERTILITY AND MIGRATION; FERTILITY AND POPULATION GROWTH; INDIRECT ESTIMATION OF FERTILITY AND MORTALITY (in which methods of estimation are discussed); INTERNAL MIGRATION; articles on DETERMINANTS and EFFECTS; LABOR FORCE; LAW AND FERTILITY REGULATION; article on WORLDWIDE PERSPECTIVES; REFUGEES; and VALUE OF CHILDREN. Throughout the work additional references to developing countries are made in many entries.

Entries on specific developing countries and on regions with sizable proportions of developing countries include ASIA; BANGLADESH; BRAZIL; CARIBBEAN REGION; CHINA; INDIA; INDONESIA; LATIN AMERICA; MEXICO; NIGERIA; NORTH AFRICA AND SOUTHWEST ASIA; OCEANIA; and SUBSAHARAN AFRICA.

DENSITY

See DISTRIBUTION; URBANIZATION; *article on* MEASUREMENT.

DEVELOPMENT

See FERTILITY AND DEVELOPMENT; POPULATION AND DEVELOPMENT.

DIRECTORIES

Directories can be divided into two categories: directories of individuals (members of professional organizations, or people with similar interests) and directories of organizations.

Individuals. Many professional organizations publish membership directories. In the population field these include, among others, the International Union for the Scientific Study of Population (IUSSP) in Liège, Belgium; the Population Association of America in Washington, D.C.; and the Association des Démographes du Québec in Montreal, Canada. In addition to the directories issued by these organizations, the programs of annual conferences of professional organizations frequently provide the addresses of members and presenters of papers, which can serve as directories or can serve to update information in formally published directories.

Notable among directories of people with similar interests is *Population Anthropology: An International Directory of Contributors and Their Works* (1978), compiled by Moni Nag of the Population Council in New York. This directory lists anthropologists, their addresses, and bibliographic citations of their population-related works. The *African Directory of Demographers* (1980), now in its fourth

edition, was first published in 1967 as an outgrowth of the World Population Conference held in Belgrade in 1965. The directory includes information relating to demographers from African countries as well as to demographers from other countries who specialize in African studies. Presented in a geographical arrangement, it provides addresses, lists of areas of interest, and information on employment history, society memberships, degrees, honors, and publications. The *International Directory of Abortion Researchers* (1973), published by the International Reference Center for Abortion Research, provides indexes to researchers' geographical and subject interests, and gives institutional affiliations, in an alphabetical presentation.

Organizations. One of the most comprehensive international organizational directories is the *1975 Address List* (Gleiter, 1975), published by the Carolina Population Center, Technical Information Service, at the University of North Carolina. This address list serves as a supplement to the *International Directory of Population Information and Library Resources* (Fogle, Gleiter, and McIntyre, 1972) and its supplement (Gleiter and Fogle, 1972), which provide information on the personnel, programs, publications, library collections and services, and information activities on 250 population-related organizations. The *1975 Address List* not only gives names and addresses of these organizations and provides an index to the directory and supplement listings but also gives names and addresses of an additional 750 organizations in a geographically classified arrangement. *The Directory of IEC Assistance and Services* (Buck, 1976) describes agencies and organizations that provide assistance and services in the area of information, education, and communication in the population field.

The Committee for International Coordination of National Research in Demography (CICRED) has compiled the *Directory of Demographic Research Centres,* which was issued in loose-leaf format in 1974 and updated in 1975. The directory contains such useful information as principal demographic research objectives, current demographic research, representative recent publications in the field of demography, areas of interest other than demographic research, and names of the officer in charge and of professional staff.

The above-mentioned directories were compiled by researchers or organizations working in the population field. *Population: An International Directory of Organizations and Resources* (Trzyna, 1976) is, however, published by the Public Affairs Clearinghouse in Claremont, California, which publishes reference works on national and world problems and on state affairs in the United States. This directory is arranged by type of organization: intergovernmental, international nongovernmental, U.S. organi-

zations, Canadian organizations, and organizations of other countries. It provides, in addition to the usual directory-type information, the purpose of the organization, the date it was established, and its publications.

Directories of service organizations include the *World List of Family Planning Agencies,* issued by the International Planned Parenthood Federation (IPPF); *Planned Parenthood Affiliates and Chapters,* issued annually by the Planned Parenthood Federation of America, lists these organizations for the United States. The *Directory, Family Planning Service Sites, United States* (1977), issued by the U.S. National Center for Health Statistics, lists the addresses of 5,636 sites that provide family planning services in the United States and outlying areas.

Another group of special-interest directories are those that list training programs: *Training and Development Omnibook,* issued by IPPF in 1976 and kept up to date with supplements; *Training Facilities in Population and Family Planning in the Western Hemisphere Region* (Weinstein, 1979); *Research Teaching and Training in Demography* (1972) and its 1974 and 1975 supplements, issued by the United Nations Economic Commission for Asia and the Far East; and *Directory of Population Research and Family Planning Training Centers* which was issued by the Planned Parenthood Federation of America, Katharine Dexter McCormick Library, in 1979.

Directory information also occurs within other publications. For example, appended to the *Sourcebook on Population, 1970–1976* (Bussink, van der Tak, and Zuga, 1976), which is essentially a bibliography, are lists of "Population Programs and Organizations." The Population Crisis Committee's newsletter, *Population,* occasionally devotes an issue to "Private Organizations in the Population Field." Also, the *Population Reference Bureau's Population Handbook* (Haupt and Kane, 1978) includes regional information on selected organizations engaged in international population activities.

A number of publications describe projects and delineate in detail the financial and research activities of organizations. These publications include the *Inventory of Population Projects in Developing Countries around the World,* issued annually by the United Nations Fund for Population Activities, and its companion volume, *Guide to Sources of International Population Assistance,* issued every three years; and, for the United States, the *Inventory and Analysis of Federal Population Research* (1980) and *Inventory of Private Agency Population Research* (1980), both issued by the U.S. Interagency Committee on Population Research.

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DISEASE

See EPIDEMIOLOGIC TRANSITION; MORBIDITY AND LONGEVITY.

DISEASES, INTERNATIONAL CLASSIFICATION OF

See INTERNATIONAL CLASSIFICATION OF DISEASES.

DISPERSION

See DISTRIBUTION, *article on* DISTRIBUTION, CONCENTRATION, AND DISPERSION.

DISPLACED PERSONS

See REFUGEES.

DISTRIBUTION

The spatial organization of populations and the diversity among geographic areas in their demographic characteristics are themes basic to population study. The first article in this entry presents methods for measuring the distribution, concentration, and dispersion of populations. The second article, on DISTRIBUTION POLICY, *discusses distribution as a subject of concern to governments. Causes and effects of changes in settlement patterns are treated under the headings* FERTILITY AND MIGRATION; INTERNAL MIGRATION; INTERNATIONAL MIGRATION; LABOR FORCE; *and* URBANIZATION. ECOLOGY *deals with the location of populations in space and time in relation to their environments. The distribution of populations is also described in country and regional articles. Location differentials in mortality and morbidity are discussed in* MORTALITY; MORBIDITY AND LONGEVITY; *and* EPIDEMIOLOGIC TRANSITION; *and fertility differentials in the entry* FERTILITY DECLINE. *Location differentials in marriage are described in* AGE AT MARRIAGE.

1. DISTRIBUTION, CONCENTRATION, AND DISPERSION
2. DISTRIBUTION POLICY

Eduardo E. Arriaga
Regina McNamara

1.
DISTRIBUTION, CONCENTRATION, AND DISPERSION

The distribution, concentration, and dispersion of population over a territory changes as a consequence of area differences in mortality, fertility, and inter-area migration. Each of these population dimensions is closely related to the urbanization process of a society [*see* URBANIZATION, *article on* MEASUREMENT]. Each dimension reveals a particular aspect of the population dynamics of choosing a place of residence. This article presents some of the techniques and indexes used for detecting how a population is distributed in an area and how the changes in concentration and dispersion can be measured.

Measures of Distribution. Several different methods for analyzing the distribution of population over a country's territory are available. Among the most frequently used are the index of the center of population, population maps, the average distance between farmhouses, the index of population potential, and the index of the distribution of cities.

Center of population. The index of the center of population summarizes the distribution of population over a geographic area; it represents the point at which all individual distances in any direction cancel out. To calculate this index the geographic longitude and latitude of each inhabited place in the country is weighted by its population. The longitude of the center of population is obtained by the equation

$$LO = \frac{\sum_{i=1}^{m} P_i LO_i}{\sum_{i=1}^{m} P_i}, \quad (1)$$

where P_i is the population of particular place i, LO_i is the geographic longitude of place i, and m is the number of inhabited places. Similarly, the latitude of the population center is located by

$$LA = \frac{\sum_{i=1}^{m} P_i LA_i}{\sum_{i=1}^{m} P_i}, \quad (2)$$

where LA is the latitude of the place i. Once all urban places are taken into account in the calculation, the rural population of each administrative unit is assumed to be located at the geographic center of the unit within which it is located.

The location of the center of population and its changes indicate the geographical direction in which the

population of the region or country is settling. Although such an index has limited analytic value, it is useful for studying the distribution of population when it is combined with the population potential index, or with the index of standard distance.

Population maps. The distribution of population through space can be studied using maps that illustrate such features as density and population size. A density map is constructed by calculating the population density of each administrative unit. The densities are then classified in different class categories, and a different design or color is assigned to each category.

The population map, on the other hand, is obtained by representing a certain number of people by a dot. Dots can be of different size, shape, or color depending on the size of the population that each represents; and each dot is plotted on the map in the location where the actual population lives. Those places more densely populated will show a greater concentration of dots. Similarly, any population characteristic (e.g., urban-rural proportions, migrants, or labor force) can be represented on a map for different subdivisions of a country.

Average distance between farmhouses. Another possibility is to study the distribution of rural populations by using the concept of the average distance between farmhouses. This can be calculated by the equation

$$D = 1.07\sqrt{A/N}. \tag{3}$$

Here A represents the area of an administrative unit and N the number of farmhouses in the area; 1.07 is a constant obtained in deriving the equation. Two kinds of maps can be made using the average distance between farmhouses. In one, small areas are classified according to the average distances between farmhouses, and each category is assigned some distinguishing characteristic, as in plotting a density map. Another kind of map is made by allocating to the central point of each area the average distance between farmhouses for that area, and then connecting the points with the same average distances.

Population potential. The population potential index relates population and distance; it measures the potential for interaction in an area. It assumes that the closer people live to one another the greater is the potential for social interaction; that is, interaction is assumed to be inversely related to distance. If a country has its population distributed in m places, the index of population potential, W, for particular place a is calculated as

$$W_a = \sum_{i=1}^{m} P_i/D_i, \tag{4}$$

where P_i is the population of particular place i, and D_i is the distance between places a and i.

Maps can be drawn with lines connecting the points with the same population potential. These lines represent the potential for interaction and are called iso-population lines. In calculating the index of population potential, city as well as rural populations are taken into account; and, as in calculating the index of the center of population, the rural populations of the smallest administrative units are assumed to lie at the geographic center of each unit.

City distribution. Cities of different sizes can be ranked from largest to smallest. Thus, it is possible to adjust the distribution of cities with a function that relates the population size of any city to its rank and to the population size of the largest city. The relationship between the rank of any city and the size of the largest city, commonly known as the rank-size rule, can be written in its most general form as

$$C_k = (C_1)(k^{-z}), \tag{5}$$

where C_k represents the population of the city ranked in place k from the largest to the smallest in size, C_1 is the largest city, z is a constant, and k is the rank order. The value of z for each city distribution is obtained by using the least-squares method after taking the logarithm of equation (5). The equation for the rank-size rule, then, is

$$\ln\frac{C_1}{C_k} = (z)(\ln k). \tag{6}$$

Applying the least-squares principle to equation (6) transforms it to

$$z = \frac{[\sum \ln(C_1/C_k)][\ln k]}{\sum(\ln k)^2}. \tag{7}$$

Each value of z characterizes a city distribution; the greater the value of z, the greater the concentration of population in the largest cities relative to the smallest cities. One advantage of this index is that it facilitates the international comparison of city-size distributions by reducing them to a single value. Finally, a particular case of the rank-size rule also allows calculation of a measure of concentration, the index of primacy.

Measures of Concentration. The concentration of population is a dimension closely related to distribution characteristics. The four most frequently used measures of population concentration are the cumulative urban percentage, the primacy index, the Gini concentration ratio, and the city concentration index.

Cumulative urban percentage. The index of cumulative urban percentage is calculated by averaging the percentage of population in city-size categories that have a fixed lower limit and an open upper limit, that is, any higher

category is contained in all lower categories. The equation for this index is

$$CU = \frac{1}{m} \sum_{i=1}^{m} F_i, \qquad (8)$$

where F_i is the percentage of population in the open category i, and m is the number of city-size categories employed. The percentages can be calculated for city-size categories such as 10,000 and over, 20,000 and over, 50,000 and over, and 100,000 and over.

The limits of this index are 0 when there is no urban population and 100 when all the population lives in the highest category. Since the value of the index is affected by the number of categories and the lower limits chosen for each category, the same categories should be maintained if comparisons are to be made. In establishing city-size categories, account should also be taken of the fact that if the highest open category has a rather low lower limit (e.g., 100,000) the population in cities of one million or more will not be effectively reflected in the index. On the other hand, if the highest category has a very high lower limit (e.g., 3,000,000) there may be countries with 0 percentage in this category.

Primacy. The primacy index is related to the rank-size rule. If the exponent z of the rank k in equation (5) is 1, the size of any city will be equal to the largest city C_1 divided by its rank ($C_k = C_1/k$). Under this condition the population of the largest city is equal to the population in the second-ranked, third-ranked, and a fraction of the fourth-ranked cities. The equation for the primacy index for four cities is

$$PI_4 = \frac{C_1}{\sum_{k=2}^{4} C_k}, \qquad (9)$$

where C_1 is the population of the largest city, and C_k for $k = 2$, 3, and 4 represents the populations of the cities ranked second, third, and fourth, respectively. If the assumption is valid, addition of the populations residing in the cities ranked second, third, and fourth would yield $\frac{13}{12}$ of the population of the city ranked first ($\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{13}{12}$). Thus, when the population of the first-ranked city is divided by the summation of the populations of the three following cities, the quotient will be close to 1 if the cities follow the rank-size rule. Therefore, it is assumed that the index measures the concentration of population in the first-ranked city in relation to the remaining three cities. The greater the index value, the greater the concentration in the largest city.

Other comparisons between the largest city and the next largest cities can be made. Because of the particular

number and size of cities in a territory or country, it might be preferable to compare the largest city to the next ten. This procedure may give a better measure of the primacy of the largest city, because more cities are included. When the first-ranked city's population is divided by the sum of the population living in cities ranked second through eleventh, the quotient should be close to 0.5 (i.e., $\frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{11} = 2$). Hence doubling the size of the first-ranked city results in a quotient of 1. The primacy index for eleven cities is

$$PI_{11} = \frac{2C_1}{\sum_{k=2}^{11} C_k}, \qquad (10)$$

and again the greater this quotient, the greater the concentration of the population in the largest city in relation to the other cities.

Another possibility in analyzing the concentration of population in cities is to compare the actual distribution of all cities to what would be expected by the rank-size rule. When this is done, the cities should be grouped so that the expected population in each group will be the same. The comparison of the distribution with the expected distribution (the same population in all groups as the population of the largest city) will show which cities contain relatively higher concentrations of people.

For instance, if the distribution of the urban population is assumed to correspond to the rank-size rule with a constant z equal to 1, the following groups of cities will have practically the same population:

$$C_1 = \sum_{k=2}^{4} C_k = \sum_{k=5}^{12} C_k = \sum_{k=13}^{34} C_k = \sum_{k=35}^{94} C_k = \ldots \quad (11)$$

Gini concentration ratio. The Gini concentration ratio, or Gini index, has been widely used for the measurement of concentration. In addition to its use to measure the distribution of a population over land space, it can also be used to measure the concentration of other social and economic characteristics in populations.
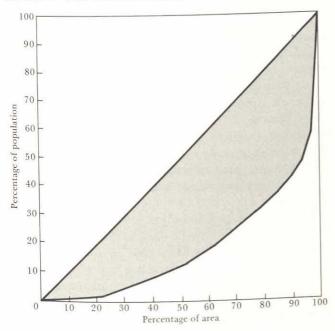
The Gini index measures the distribution of one variable relative to another. When the variables are population and area, the index measures how uniformly the population is distributed over area. For instance, if a population were uniformly distributed over an area, any given 20 percent of the area would be occupied by 20 percent of the population and any given 60 percent of the area would be occupied by 60 percent of the population. On a graph of coordinates where the x-axis represents the cumulative percentage of the area and the y-axis the cumulative percentage of the population, the relation-

ship of area and population would be represented by a straight line extending at 45° from 0. Actually, such conditions never occur, because populations tend to concentrate in certain regions, so that a large proportion of a country is occupied by a small proportion of the people and vice versa. When data for actual conditions are plotted on a graph, the line relating area and population will not be straight but a concave curve. Although at 0 and 100 the plotted curve and the straight line will coincide, between these extremes they will differ, as shown, for example, in Figure 1. The Gini concentration ratio measures the area between the straight line and the plotted curve, the shaded area in the figure. This index varies from 0, which is attained when populations are evenly distributed, to almost 1, which is approached when the entire population is concentrated in a very small area.

The Gini concentration ratio is affected by the size of the units employed. For instance, if the index is calculated using the largest political divisions of a country, its value will be different from that obtained using the smallest political divisions. In general, the smaller the area of the subdivision employed, the larger the index value.

The Gini index can also be used to study the concentration of population in cities. Data on all areas are not required, but a list of the largest cities is needed. Either all cities or only a selected group of cities, such as those with 100,000 or more inhabitants, can be included in a study of concentration. When concentration of city populations is thus analyzed, the general equation proposed by Gini can be simplified to the following:

$$CR = \frac{n-1}{n} - \frac{2\sum_{k=2}^{n}(k-1)\,C_k}{n\sum_{k=1}^{n}C_k}, \qquad (12)$$

when n represents the number of cities being considered, C_k stands for the population of the city ranked in place k (rank 1 for the largest and rank n for the smallest), and k is the rank $(1, 2, 3, \ldots, n)$.

When comparisons among different populations are made, calculation of the index for the n largest cities and for all cities over a particular population size is recommended.

City concentration. The city concentration index is based on the concept of a mean city population size as a measure of the degree of urbanization. The city concentration index compares the achieved mean city population size, MC, with the possible maximum city size as if everyone were living in one city. Hence the city concentration index is

$$CC = MC/P, \qquad (13)$$

where MC is the index of degree of urbanization (mean city population size) and P is the total population. If MC is replaced with its equation [see URBANIZATION, *article on* MEASUREMENT, *equation* (3)] the city concentration index can be calculated as

$$CC = 100\,\frac{\sum_{i=1}^{u}C_i^2}{P^2}, \qquad (14)$$

where C_i is the population of city i, and u is the number of cities included as urban.

The city concentration index can vary from near 0 $(1/P)$ to 100. Zero is approached when there are no cities, and the upper limit is achieved when all people are concentrated in a single city. Since this index is based on the index of mean city population size, it is affected by the delimitation of city boundaries.

Comments on Concentration Indexes. Concentration indexes measure the concentration of population relative to an area or to a number of units such as cities without taking account of the distance that separates populations. For instance, in calculating the Gini concentration ratio, areas separated by a considerable distance are considered to be next to each other if they have the same density. (It should be remembered that the purpose of the index is to measure how crowded a population is relative

FIGURE 1. *Gini concentration ratio*

to land space, but it does not take into account where populated areas are located.) Similarly, the city concentration ratio considers the relative concentration of city population but not where cities are located. Thus, when concentration indexes are used, it is important to bear in mind that they do not differentiate between territories or countries in which cities are close together and those in which they are not.

A hypothetical example will clarify this limitation of concentration indexes. Assume that there are two countries with the following characteristics: (1) both have the same total population, land area, and shape, a square; (2) both countries have four cities of different sizes, but each city has a "twin" city with the identical population in the other country; and (3) the population living outside the cities in each country is evenly distributed. In one country, however, each of the four cities is located in a corner of the square; in the other country the four cities are all concentrated in one corner, but they do not constitute a single metropolitan area. For both countries the concentration ratios, the cumulative urban percentages, the primacy indexes, and the city concentration indexes would be the same, although it is obvious that the population of the country with the four cities located in one corner is more "concentrated" than the other. This situation is not detected by any of the four concentration indexes because they do not take into account the distances between cities or individuals.

Some indexes, however, do take account of distances between people. For instance, the index of population potential assumes that the population interaction is inversely related to distance. Some idea of the dispersion of population can be obtained when the population potential is calculated for the center of population. Also, the average distance between farmhouses considers how far rural people are from one another.

Measure of Dispersion. Population dispersion reflects distance between either people or aggregates. More than one such index has been devised, but the index of standard distance is the most frequently used.

This index gives the quadratic average of the distance between each inhabited place and the population center of an area or country. Symbolically, the standard distance is expressed as

$$SD = \sqrt{\frac{\Sigma P_i D_i^2}{P}}, \quad (15)$$

where P_i is the population of inhabited place i, D_i is the distance from i to the center of population, and P is the total population of the area. Calculation of this index involves calculating the center of population, using equations (1) and (2) and then calculating all the distances to

every inhabited place. For the population living in cities this distance will be from each city to the center of population; however, for the population living outside cities it is assumed that the entire population of the administrative division lives at the division's center. Distance to the center of population can be measured using longitude and latitude so that the linear distance between the population center and particular city i would be

$$D_i = \sqrt{K^2 (LO - LO_i)^2 + Q^2 (LA - LA_i)^2}, \quad (16)$$

where LO and LA are the longitude and latitude, respectively, of the center of population, LO_i and LA_i are the longitude and latitude for particular city or administrative center i, and K and Q are constants for converting the geographical degrees to linear units. In general, a higher value of this index will indicate a greater degree of population dispersion.

This index can be interpreted as the standard deviation of the distribution of population from the center of population. As Roberto Bachi has said, "It enables one, inter alia, to describe synthetically the actual dispersion of a phenomenon, to compare it with the dispersion to be expected under certain hypotheses, to appraise its change over time, and to compare it with the dispersion of other phenomena" (1957, p. 231). Using this index in combination with those measuring population concentration gives a better understanding of distribution than when concentration or dispersion indexes are used alone.

Summary. Five measures of the distribution of population were presented; two of them (the center of population and population maps) focus upon the distribution of population over territory; and three (average distance between farmhouses, population potential, and the city distribution index) focus upon the relative distribution of population units to one another. The concept and measurement of the center of population is basically designed to illustrate the geographic direction in which population settlement is moving. By itself, this index has little practical or theoretical value in the international study of urbanization; however, it can be employed in conjunction with other indexes, or calculated at successive points in time and compared to indicate how urbanization in a country is bringing about shifts in the distribution of population.

Population maps are also frequently used to illustrate distribution. They are useful graphic displays that permit brief and rapid summaries of how populations are distributed over areas. When interest is focused basically on rural populations, maps using the concept of average distance between farmhouses are recommended. The index of population potential can be used to indicate the po-

tential for interaction in a population occupying a particular area.

Another aspect of the distribution of population is the relationship of cities of different size to each other. The rank-size rule assumes that the size of each city is generally related to its rank through an exponential function. The exponent of this function, z, summarizes the extent to which the distribution of population by city size is concentrated in the largest cities relative to what might be expected assuming that cities are distributed exponentially by size.

Whereas measures of distribution allow the researcher to assess the spatial arrangements of populations, measures of concentration and dispersion allow an assessment of the extent to which populations tend to cluster at certain points or in cities with certain characteristics. Four measures (cumulative urban percentage, primacy, the Gini concentration ratio, and the city concentration index) assess the concentration of population units independent of the distance separating the units, while only one, the standard distance index, takes separation into account. When the index of standard distance is calculated for the location of the population center, it can be interpreted in terms of the standard deviation of the distribution of the population from its center.

<div align="right">Eduardo E. Arriaga</div>

See also MATHEMATICAL DEMOGRAPHY; URBANIZATION.

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2.
DISTRIBUTION POLICY

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Surveys of national governments by the United Nations show that few countries are satisfied with the spatial distribution of their populations. Most countries find that rapid growth of one or a few cities creates an imbalance among regions in the availability of labor and opportunities for employment (United Nations, 1980). Policies concerned with this perceived maldistribution may be broadly classified by two major objectives: (1) regulation of the rate of growth of urban centers or (2) development of rural areas. In practice, objectives and effects are usually not so clearly distinguished. Rural resettlement projects, for example, can slow the rate of migration to cities as well as increase agricultural productivity. National policy that is not explicitly concerned with distribution, but through its social and economic effects largely determines the rate and direction of internal migration, is discussed only briefly in this article. [*See* INTERNAL MIGRATION, *articles on* DETERMINANTS, EFFECTS, *and* MODELS.]

Direct government intervention intended to regulate the flow of migrants to large cities takes various forms. Compulsory registration of in-migrants, exportation of people back to rural areas, a citizenship tax on city residents, food rationing in the cities, and outlawing some self-employment activities are examples. The periodic demolition of squatter settlements in urban areas and relocation of the residents has been tried, especially in Latin America, but these measures have failed to discourage in-migation. Squatters tend to return, joined by new arrivals.

A "closed city" policy was implemented in Indonesia in 1970 to limit migration into the capital of Java. This strategy called for registration of migrants and collection of cash deposits, along with restriction of self-employment enterprises such as street vending and operating pedicabs, occupations that provide a livelihood for many recent migrants. Enforcement of such controls, however, is usually beyond the power of the authorities. Eastern European countries have been more successful with direct control. Poland, by allocating housing to in-migrants on the basis of job priorities, restricted migration to Warsaw and nearly all of its other large cities from 1955 to 1970. This probably slowed the rate of internal migration, but it also created a large group of commuters traveling long distances to jobs in the cities. In South Africa, entry permits are used to control the movement of Bantu workers into certain industrial areas. According to this internal "passport" system, workers enter and reside in a prescribed area for a specified period, after which they must return to their homelands or apply for re-

newal. China has had a registration system since 1958 that is intended to strictly control unplanned movement to the cities.

A different strategy involves decentralization of government activities. In Brazil, the capital itself was transferred to a region with sparse population, a move that has been undertaken or seriously contemplated by other countries. The creation of states and state capitals in Nigeria is an example of administrative decentralization that stimulates the growth of secondary cities. Cuba encourages balanced distribution by its allocation of funds. Small urban centers have higher priority than Havana for social investments such as schools and housing construction.

Subsidies and other economic incentives, as well as capital investment by governments, have gone to create intermediate-size urban "growth poles," "industrial estates," or "new cities." This approach has been successful when the new cities have employment opportunities, services, and amenities that are sufficient for the site to compete with already existing areas. Singapore provides an example of a vigorous and efficient housing and industrial development program that has moved large numbers of people into satellite towns around the island. In South Korea, during the early 1970s, the government introduced tax and credit incentives for industrial investment in smaller cities around Seoul, and they subsequently grew at a much more rapid rate while Seoul's growth rate declined.

Nevertheless, the economic base and administrative resources necessary to create urban "countermagnets" to the attraction of the dominant metropolitan areas have generally been beyond the capabilities of the less-developed countries. More successful examples come from countries such as the Soviet Union, Sweden, Great Britain, and France. In Great Britain, where the distribution of the population has been a major demographic concern, the idea of "garden cities," that is, new, planned settlements with factories, homes, schools, and shops surrounded by open land, was first put forward in the late nineteenth century. In the 1940s, a series of new towns was planned to provide for a gradual dispersion of industry and population from London. These new towns are expected to accommodate more than 2 million people by the mid-1980s. The original plans were for populations between 50,000 and 60,000 in each, but goals are now substantially larger, as they are for new towns in France and the Soviet Union.

Rural development programs may provide housing, electrification, credit, and price supports for farm products in an effort to reduce migration to the major cities. When such programs also provide incentives for consolidation of land holdings and methods for agricultural production that reduce the need for labor, they actually stimulate out-migration. Land-tenure reform also may not be effective in motivating rural populations to remain in rural areas. The distribution of land and formation of cooperatives in Peru, for example, may have slowed out-migration only in the generation that received the land, and not among their children. Access roads, a usual component of rural development plans, often stimulate migration out of the rural area, as does education.

Colonization, or the planned settlement of newly opened agricultural areas, has been attempted by countries with an abundance of land or with severe regional imbalances in the distribution of the population. In Indonesia, attempts to relieve population pressure in Java and Bali by moving people to the Outer Islands started under Dutch rule in 1905 and have continued to the present. Such efforts at subsidized migrations have often foundered on organizational problems, shortage of irrigation and transport facilities, depletion of cultivable land, and cultural differences between migrants and native populations. Relatively successful experience with the movement of a surplus rural population to new areas, as reported from Sri Lanka and Malaysia, is attributed in part to the organization of necessary services and financial support for the colonists, combined with broader rural development programs.

Planned migration from the city to the countryside is less common, and the forced evacuation of Phnom Penh in Cambodia in 1975 is the extreme of contemporary examples. China's rustication program for urban youth sent about 12 million from the cities to the country between 1968 and 1975, reducing the urban population by about 10 percent. Vietnam plans a variety of incentives for a large-scale movement of the urban populations to rural areas in order to reduce urban unemployment and increase agricultural production.

Some development schemes require consolidation of scattered populations. The most ambitious of these was undertaken by Tanzania in the 1960s and 1970s when just about all of its rural population was settled in villages in a planned program that enlarged already existing villages and created new ones. In Cuba, construction of new rural communities, primarily for agricultural workers and their families, has been part of that nation's overall policy to develop rural areas and small urban centers.

Considerable rural-to-rural migration is indirectly influenced by government policies. The opening of new lands for individual settlement, disease control, political stabilization, highway construction, and irrigation projects all stimulate sizable spontaneous migrations.

Resettlement of rural populations for security reasons

or to make way for development projects involves the uprooting of the entire population of a given area or community and its reestablishment in new locations. These may be temporary resettlements, forced by wars, floods, or droughts, or they may be permanent, such as those caused by the construction of reservoirs. One estimate of the number of people dislocated by reservoirs alone in the last quarter century is more than 2 million, excluding projects in China and the Soviet Union. Political or security motives have caused much larger resettlements: more than 700,000 people in Malaya between 1950 and 1954; more than 2.25 million in Algeria between 1954 and 1961; millions more in Mozambique and Angola between 1965 and 1974. More than 20 million blacks in South Africa are being resettled in areas designated as homelands for their ethnic groups.

Classifying distribution policies according to whether they were designed primarily to control urban growth or to develop rural areas is a useful approach to reviewing the variety of forms that explicit distribution policy can take. Other useful classification systems stress incentives or disincentives offered by governments (Fuchs and Demko, 1979), or focus on policies concerned with individuals and families as distinct from employing institutions. Another perspective distinguishes policy measures that result in spontaneous redistribution from those that induce redistribution (Abumere, 1981). This last typology may specify several levels of government intervention. Spontaneous movement may follow intervention in the form of housing, training programs, or information, and induced migration may be the result of government sponsorship of settlements or compulsion (Gosling, 1979). There is also the policy of nonintervention, characteristic of the countries with free market economies where it is assumed that individual economic self-interest will bring about efficient distribution of the population. The level of intervention depends not only upon the urgency with which governments view prob-lems of spatial distribution but also upon their economic resources and the political context for formulation and implementation of distribution policy.

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DIVORCE

See FAMILY LAW; MARRIAGE AND DIVORCE.

E

ECOLOGY

The term "population ecology" is defined as the study of population in relation to environment. It deals with questions of environmental carrying capacity; equilibrium or optimum population size; causes, mechanisms, and controls on population growth; distribution tendencies; and implications of population parameters.

The Ecosystem Concept. Population ecology makes full use of demographic techniques for purposes of description and analysis, but it also directs attention to the problem of explanation. The theoretical framework employed in the pursuit of explanation is represented by the concept of an ecosystem. The term "ecosystem" introduced initially in the literature of general ecology to denote a unit of analysis (Dice, 1952; Odum, 1963), refers to an assemblage of differentiated and interrelated organisms together with their common habitat. More recently the term has found its way into social science usage (Boulding, 1953; Duncan, 1964; Hardesty, 1977), though with certain modifications. Important among those is the treatment given speciation in which functional differentiation is treated as analogous to biological differentiation. The nearest parallel in conventional social science literature to the ecosystem notion is the concept of community, broadly construed. Ecosystem and community are alike in possessing a location in space and time, that is, a habitat, a population, a structure, and a characteristic developmental process.

The definition of ecosystem also defines the effective population unit for human beings as for other forms of life. Applications of the definition present more serious difficulties for humans, however. Since boundaries are located at the outer edges of networks of interrelationships, there is a question of how frequently and with what degree of directness the interactions must operate in order to delineate a system. Perhaps such questions are arbitrarily resolved in the statement of the problem an investigator elects to study. A further consideration concerns the very great changeability of boundaries. An ecosystem as of one point in time may have quite different dimensions at a later moment. Finally, population data available to an observer are usually prepared for political units, which, more often than not, fail to coincide with ecosystems. The following discussion will return to this matter in later paragraphs.

Climax and Equilibrium. Of the several properties of an ecosystem the developmental process is of central importance, for it provides a model that brings order to an understanding of the various interactions involving population. "Succession," as the process is called, is a movement toward adaptation following a disturbance of an equilibrium state. As a population passes through a series of organizational stages, it undergoes characteristic demographic changes. The process concludes with a new equilibrium, designated as a climax stage. At that stage the fullest possible sustainable utilization of the habitat is reached. Although the succession hypothesis is not entirely transferable to human experience, it may serve tentatively as a prototype for an ecological analysis of human population.

That equilibrium is not just an intellectual construct

designed for heuristic purposes is argued by many students of simple societies. Cultural evolution, it is held, tends toward a natural balance between an integrated technology and a set of means for ensuring that demands on the environment do not exceed the resources (Wilkinson, 1973, pp. 18–19; Dumond, 1975, p. 714). Accordingly, the size of population is said to be determined by the carrying capacity of the environment. Environmental differences permit corresponding differences in sizes of aggregates.

A natural population-environment equilibrium implies stable demographic characteristics. In the logic of the case, birth and death rates are equal, usually at a level of 35 or 40 per 1,000 per year. Since the replacement, or net reproduction, rate is at unity, population size is unchanging from year to year. The age distribution approximates that of a stationary population, with about 30 percent of the population under 15 years of age, 60 percent aged 15 to 60, and 10 percent over 60. Since there is no migration into or out of the group's territory, age distribution remains undisturbed. A death rate of 35 per 1,000 and a stationary age distribution indicate a life expectancy at birth of 28.6 years, for the latter is a reciprocal of the former.

Departures from Equilibrium. Some of these demographic characteristics find support in existing data; others must rely upon inference from equilibrium assumptions. The available data on primitive demography range from poor to nonexistent. Such data as are available suggest that a replacement rate at unity may occur only as an average based on a considerable number of years. Crude birth and death rates must be estimated from age composition, which in simple societies is rarely subject to systematic reporting. Consequently age-specific rates lie beyond the demographer's reach. It is known, however, that primitive groups have little or no control over mortality; consequently the death rate can fluctuate widely from year to year. On the other hand, sexual abstinence and prolonged lactation provide means of fertility control. These are often supplemented by other institutionalized practices, such as infanticide and patricide. Instabilities of vital rates combined with customs of selective elimination of members introduce irregularities in age distributions. Thus stable population age distributions are not to be expected in any given interval of time.

The notion of an unstable equilibrium is more tenable for simple societies than is that of a steady state. It is quite likely, as some anthropologists observe, that the oscillations of population numbers range about a size somewhat below that expected at a Malthusian asymptote. The durability of such groups despite their very limited environmental controls lends weight to an inference of that kind. But whatever may be the equilibrium point,

the mechanisms involved in its maintenance should discourage any unqualified use of the idea of environmental "carrying capacity." The number of people that can be sustained in an area depends as much, if not more, on the organization and technology possessed by a group as it does upon the resources of the habitat.

Optimum Population. A concept bearing some similarity to the notion of environmental carrying capacity is that of optimum population. This concept proposes that the attainment of a communal desideratum is a function simply of the number of people involved in the community. For that to be true it must be assumed, as in the carrying-capacity concept, that everything else is constant. And among those constants are age and sex composition, ages of entering and leaving the labor force, work habits, tools and techniques, organization of the division of labor, imports and exports, and the domestic distribution of the product. But studies of simple societies usually lack the temporal depth needed to observe the degree to which structural stability has existed. Moreover, few such societies available for study, if any, have been undisturbed by external cultural influences. In any event, because technology and organization may be relatively constant during a period of observation is no basis for assuming they can be neglected in judgments of either the number of people supportable in an area or the number needed to produce a common good.

A related question concerns whether an equilibrium population is optimal for a group. The answer depends in large part on how the group defines the optimum. It is quite possible, however, that under some conditions, as, for example, rapid environmental change, an equilibrium population might not have group survival value. Yet it is probable that survival value does not usually enter into optimum definitions until a crisis of cataclysmic scale threatens. In fact, optimum definitions are so exposed to idiosyncratic influences that no general answer to the question is feasible. But if the optimum concept is made more specific, it could be compatible with an equilibrium situation. Thus one might think of an optimum density as that which affords a required frequency of interaction at minimum cost in time and energy, or of an optimal size of a maturing age cohort as that capable of supplying more or less exactly the personnel required for the operation of existing institutions. Here again the definition is critical to the use of the term.

Cycles of Growth. The glacial growth of human population in the premodern millenia fosters an illusion of a smooth, monotonic trend. Large departures from a trend, however, have occurred often enough to require a substitution of a concept of cycles for the idea of a relatively smooth linear progression. Several long swings of decline and growth have been detected in Chinese history from the Han dynasty to the early twentieth century. It is en-

tirely likely that similar cycles were experienced by many other less-well-known populations, some of which failed to recover from the down swings. More than one Mesoamerican population is known to have flourished and disappeared. European population concluded a growth phase in the third century A.D., after which it went into decline until the seventh or eighth century, then resumed growth only to decline once more in the fourteenth century. The most recent growth phase of European population began sometime during or shortly after the sixteenth century and has continued into the present. Growth has been resumed recently in virtually all of the non-European parts of the world.

All periods of increasing population probably have had one thing in common, that is, they began with an altered relationship of population to environment from which followed a decline of the death rate. The introduction of more productive varieties of rice, as in China, the opening of new lands for settlement in medieval Europe, or the improvements in agricultural technology in the modern period of the West increased the food supply, reduced the incidence of famine, and curtailed the diseases associated with malnutrition. In all but the latest of the periods of increase, fertility rates seemed to have remained fairly constant, with the result that population increased up to the number needed to exploit the increased resources or to staff the expanded technology. Growth beyond that size was doubtless restricted by a return of mortality rates to a near balance with fertility rates.

The Demographic Transition. Knowledge about the latest period of population increase is vastly superior to that concerning earlier periods of growth. Even so, many imperfections remain, for the practices of census taking and vital statistics registration are not only of recent origin but have been almost continuously in process of improvement. From what is known, however, it appears that the newest period has one unique combination of features. That is best described in the context of a model that has been put forth to represent the modern growth pattern. The "demographic transition," as that model is known, is the counterpart in the human ecosystem to succession in the biological ecosystem. The term denotes a course of change beginning with birth and death rates in an unstable equilibrium at a high level and proceeding through, first, a decline in mortality with birth rates remaining unchanged for a period, allowing the excess of births over deaths to widen and population growth to accelerate, and then, second, a decline of fertility and a slowing of population growth as birth and death rates return to a new unstable equilibrium at a low level. It is this second phase of the cycle that appears to be unique.

It is not to be assumed that the curves followed by death and birth rate declines are without irregularities. Historical researches on European populations are disclosing various departures from smooth lines. Nor is the time lapse between the downward turns of the two rates everywhere the same; it has ranged from as much as one hundred years in the European experience to as little as three decades in Japanese history. As the time interval has been shortened, the slopes of the curves have become steeper. Finally, it appears that factors operating to bring about changes in environmental relationships have differed historically. Whereas in the eighteenth and nineteenth centuries the principal modification was an improvement in food supplies as a result of technological advances affecting the amount, quality, and transportability of foods, in the twentieth century modern medical and sanitary knowledge was diffused with agricultural and transportation technologies to alter significantly the environmental relationship in the non-Western world. The epidemiology of the transition, however, appears to have been similar in both early and late experiences with mortality decline. Advances in environmental controls have reduced the incidences of infectious diseases and have allowed degenerative diseases to become numerically predominant [see EPIDEMIOLOGIC TRANSITION, *article on* THEORY].

Irregularities in the descending paths of birth and death rates and historic differences in the operating influences notwithstanding, the demographic transition model appears to be generally applicable as a description of population change in the modern period. Stated differently, it describes how population responds to a societal transformation that penetrates every sector of collective life. Before turning to the demographic aspects of the transition process, it will be useful to consider briefly some of the salient features of the societal transformation, including the causal role of population in sociocultural change.

Influence of Technology. That an unreversed growth of population presupposes a significant increase in the productive power of technology is not to be doubted. The nature of causation is another matter, however. Environmental influence was long ago reduced from determinism to "possibilism," or to the status of a necessary condition. The presence of a scarce resource or a fortunate location allows certain events to occur that would not otherwise take place, but such features cannot produce the events in question. The role of population in technological change finds much less agreement. Some scholars (Wilkinson, 1973; Boserup, 1976) contend that population pressure on limited resources yields innovation and technological advance. If that were true, the Javanese population would long ago have been in the vanguard of technological development and the United States would be among the most technically primitive nations. Necessity may be the progeny more often than the mother of in-

vention. The argument for the independent causal power of population errs on two scores. It fails, in the first place, to account for population growth, creating the impression that growth is entirely spontaneous and without explanation. In the second place it takes a *ceteris paribus* assumption too literally. The notion of a closed system may be suitable for the plant and animal ecosystem, but it has a very limited application to the human ecosystem. Technology advances through an accumulation of information by virtue of intergroup contacts and cultural diffusion. Increase in the number of people may affect a group's receptiveness to ideas that promise useful innovations, and it increases the labor supply as needed to operate a more complex technology. Lacking a supply of information having instrumental values, it is doubtful that any change can occur. The role of population in technical and organizational change seems rather to alternate between that of a necessary condition at one point in the process and that of a dependent variable at a later point. In other words, the interaction is such that population at time t sets a condition for structural development at time $t + 1$ and the latter in turn influences population changes that may occur between $t + 1$ and $t + 2$. As long as the supply of information continues to occur, the interaction between population and technology unfolds in a spiraling course of cumulative change.

Technological accumulation requires access to increasing expanses of territory from which to obtain supplies of raw materials for fabricating more complex tools, fuels with which to power mechanized tools, and consumer goods for an enlarged population. Access does not require territorial sovereignty. But if trade arrangements prove to be less than favorable, a group will tend to expand the territory under its control to an extent sufficient to supply the material requirements of its technology and the market for its surplus product. Historically, technological development, population growth, and politicoeconomic expansion have tended to move hand in hand, though often unevenly. There is no need here to discuss the organizational changes involved in that process. It is desirable, however, to note its implication for the environment.

Sociocultural Environment. The importance given the information supply in the causal process calls attention to the need for an extension of the environmental concept. A sociocultural, as well as a biophysical, environment must be recognized. And in the development of the human ecosystem the two aspects of the environment change their relative importance in what John Bennett (1976) has called an "ecological transition." That is, there is a progressive intervention of institutions of various kinds between a population and the biophysical realm. Access to an increasing number of resources is gained through exchange relations with other popula-

tions, and the amounts of resources obtainable are governed by pricing mechanisms, competition, and political policies. Even within the domain of a given population its uses of local resources are regulated by market circumstances and financial prescriptions. In consequence, an accurate definition of the environment becomes extremely difficult.

To return now to the demographic transition model, it is to be noted that the growth pattern in that model conforms to that described by Thomas Malthus in the eighteenth century: growth begins slowly, then accelerates to a maximum, and finally slows as it approaches an upper asymptote. The assumptions underlying the two derivations of pattern are different, however. Malthus posited an exponential growth capability on the part of population and no more than an additive power of increase of resources. As numbers begin to press upon limited resources, growth is slowed and ultimately arrested by a rising mortality. In the transition model, population growth also conforms to a sigmoid pattern, but growth is checked when resources are abundant. Fertility decline rather than mortality increase is the controlling mechanism. Consequently, as noted earlier, the equilibria differ. In the Malthusian model the birth-death equilibrium is struck at a minimum subsistence level, whereas in the transition model the birth-death equilibrium appears to be found closer to an optimum population size.

Age Structure. The demographic transition is accompanied by important compositional changes in a population. Although mortality decline, with which the transition begins, affects all age groups, it does so differentially. The greatest reduction occurs at the infant age where vulnerability to mortality risks is usually not exceeded until after some 45 years of life. Thus, if fertility remains relatively constant, as it tends to do during the early phase of the transition, the number of infants surviving from each cohort increases until the general decline of mortality tapers off at a lower level. Consequently, the population grows progressively younger. Later, when the birth rate enters upon its decline and mortality is relatively constant, the median age of the population rises, for each new cohort of infants is smaller than the preceding one. How far the median age falls or rises depends, of course, on the time space between the changes in vital rates and the duration of rate differences. In most contemporary countries undergoing the demographic transition, the difference in timing of changes has been great enough to produce extremely low median ages. It is also possible for short-term variations in fertility rates, such as have accompanied economic depression and subsequent recovery in Western countries, to introduce age distortions.

An accumulation of youth resulting from a more-rapid

decline of mortality than of fertility develops a growth momentum that continues thirty-five to fifty years beyond a return of vital rates to a replacement level. As a consequence, demographic and socioeconomic changes tend to get far out of phase. The number of people maturing to eligibility for entering the labor force and for holding leadership positions increases faster than do the opportunities for their absorption. That imbalance could serve as a stimulus to capital investments or, if investments do not occur, it produces a heavy dependency burden in the economy. Where migration outlets are present, the surplus numbers can be drained away. But without socioeconomic development in the home area emigration can be no more than a palliative to the population problem. In fact, emigration can serve as a means of preserving an equilibrium.

Wilbur Zelinsky (1971) sees emigration to frontiers as an early phase of a "mobility transition," which in its three later phases parallels the demographic transition. Inasmuch as in phase one the reorganization of land uses incidental to ecosystem development seldom, if ever, produces a territorial distribution of opportunities matching that of population, a substantial proportion of the population and probably all future increases in it must be relocated internally. Thus in phase two, technological advances reduce the personnel requirements in primary industry and expand opportunities in secondary industry, thereby generating large-scale movements from rural to urban areas. In that phase, mortality decline is already well advanced and fertility decline has begun. In phase three, marked by rapid decline of fertility, the exodus from primary industry is nearing its end and movement becomes increasingly intraurban and interurban. A final phase is one in which population growth is subsiding and in which the circulation of elites and daily commutation trips make up the major part of population movements.

A population in the final stage of the demographic transition approaches an equilibrium anomaly unlike any experienced in the biotic ecosystem. Although births and deaths return to a balance, technology gives no indication of slowing its exponential pace. Evidently a point is reached in the development of the human ecosystem at which population increments are no longer essential to further elaboration of the system. It appears, in fact, that ecosystem development at the human level brings with it a number of population equivalents such as substitutions of mechanical tools for workers and economies of scale in organizations. But, since in no area in the modern world where the net reproduction rate is at unity has the growth potential of a distorted age composition been exhausted, the outcome of the succession process and whether there is a terminal equilibrium state must be left to speculation. And, in fact, the implications of a zero

growth rate have been the subject of a considerable literature. Such explorations, however, treat national populations as discrete entities, whereas the trend has been toward a widening disparity between the boundaries of statistical reporting areas, that is, nations, and what must be recognized as the actual ecosystem.

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See also DEMOGRAPHIC TRANSITION THEORY; FERTILITY DECLINE; RESOURCES AND POPULATION.

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ECONOMICS

See AGING POPULATION; FERTILITY AND DEVELOPMENT; VALUE OF CHILDREN.

EDUCATION

The following articles discuss three main subfields of education in the field of population, namely, population education, sex education, and the teaching of demography. Each article defines the subfield and presents information on the content of teaching, on the levels of students, and on the current status of the subfield worldwide. Not treated here are the information and communication ac-

tivities conducted by family planning programs. Brief discussion of these activities can be found in FAMILY PLANNING PROGRAMS, *articles on* DEVELOPING COUNTRIES, NONCLINICAL PROGRAMS, *and* UNITED STATES.

1.

POPULATION EDUCATION

Population education is designed to develop an awareness and understanding of the nature, causes, and personal as well as social implications of population phenomena. Its content includes techniques for defining population problems and methods of ascertaining the determinants and consequences of population processes and change; it is intended to assist its students to evaluate actions that they and their communities can take to regulate those processes (UNFPA, 1978). It is thus a wider field than demography, family-life education, or sex education, with all of which it is sometimes confused. As its name implies, its purposes are educational rather than prescriptive, based as it is on the premise that a program that teaches how to define problems and search for solutions will have a greater impact than one that consists only of assertions.

The broad field of population studies attempts to explain the dynamics of human populations and their relationships with the social, cultural, economic, political, and biological environments. Population education thus encourages looking into the wide range of population issues. Although population phenomena are often popularly thought of in broad terms (the macrolevel), they also have very significant causes and consequences for the individual and family (the microlevel). The two levels do not exist in isolation; they interact, and one aim of population education is to facilitate an understanding of these interactions.

There are practical reasons why population education cannot limit itself to a single message, issue, or aspect of what has been called "the population problem." The most important is that perceptions of the problem (indeed the problems themselves, in an objective sense) differ so widely. Rapid growth, rural decline, migration, rapid urbanization, imbalanced distribution, and unwanted pregnancy, among other problems, are very different and very complex aspects of what often has been referred to simply as "the population problem" (UNFPA, 1978).

Therefore, population education varies in accordance with conditions and preferences. In some countries, population issues are approached in a context of environmental problems; in others, in terms of sexuality or the improvement of family life; in still others, in relation to development indicators and the quality of life. The subject is multidisciplinary. It considers the mechanics and dynamics of population change and its implications under various socioeconomic and environmental conditions. Likewise, it analyzes collective behavior and the role of the individual in bringing about population change, and it studies human reproduction and its effects on individuals, families and societies. In its early years, population education focused on fertility and population growth. As the subject matured, attention widened to include migration and population distribution.

Setting and Content. Population education may be formally taught at any level—elementary, secondary, or university. Formal education provides the possibility of cumulative learning covering a broad range of population issues as the student's interests and capacity to understand develop with age. That it is possible to plan births can be understood at an early age, while a child may have to wait a few years before being able to understand such things as how populations grow and the impact of such growth on employment, schooling, and other areas of development. Content may range widely, including such topics as why a government has a particular population policy; governmental policy on a resettlement scheme or family planning program; why and how a country is going to take a census; or the implications of parenthood.

Population education content may be included either as a separate unit on population, or, more often, as concepts inserted into various subject areas already in the school curriculum. For example, in mathematics classes for middle school, students might explore the difference between geometric progression and arithmetic progression by using population growth as an example. When learning how to make charts and graphs, students might be instructed to use a bar chart or a pie chart to illustrate what proportion of the population falls into certain age groups, or might plot population growth and projections on a graph and compare them with projected food supply, hospital construction, employment, etc. History and social studies students may look at patterns of rural-urban migration in their countries and may examine such aspects of this phenomenon as drain on urban social services or implications for rural communities that lose young people. They may study the impact of disease on the growth of world population throughout history, and the significance for population growth of the impact that public health measures have had on disease. Home eco-

nomics students can discuss the need for newlyweds to plan their families, the "ideal" ages for childbearing, family size, or the need for budgeting resources. Biology students can relate population change to ecology and to the responsibilities of human beings for their reproductive behavior.

Population education at the university level may train population specialists, help ensure that the most highly educated citizens are well informed on population matters, or train teachers in demographic techniques and population concepts. [*For discussion on the training of demographers, see* EDUCATION, *article on* TEACHING DEMOGRAPHY.]

One of the tasks of population education is to increase awareness of population events. This calls for instructional techniques that give students an active role in learning about the influences (including their own behavior) on the quality of life. The quality-of-life approach developed by UNESCO adviser J. E. Jayasuriya (1978) in the mid-1970s represents the predominant approach to population education taught in schools in Asia and the fastest-growing approach throughout the world. This approach is based on the following reasoning. While learners in primary school and, to some extent, in secondary school necessarily have to be passive on-lookers in terms of most population phenomena, the identification and analysis of the factors involved in improving selected facets of life can make them activists. For example, they can become immediate activists by not wasting water or food, helping to avert soil erosion, properly disposing of litter, recycling glass and aluminum (where feasible), and tending the family garden. By becoming involved in the problem areas in which they have the capacity for action, learners see themselves contributing, even if only in a small way, to the enhancement of the quality of life in the immediate present. The development of this perspective has significance for future behavior. Learning to analyze social phenomena and becoming motivated increases the likelihood that population-related action taken several years later will be based on responsible decisions.

Population education can also be provided for out-of-school youth and adults. It may emphasize topics of immediate interest to the target group. For example, for youth, human sexuality, maternal and child health, and other population and family planning issues may be taught within rural development and urban training programs before these youth assume the responsibilities of parenthood. For couples who are already at risk of pregnancy, the purpose and methods of family planning might be the principal interest, although couples might also want to learn about the present and future population situation as it relates to the kind of life their children will lead. Nonformal population education can also focus on community leaders or officials, who may be interested in studying the implications that population change has for their community, the alternative paths open to them for dealing with such change, and the linkages that can be forged between socioeconomic strategies and population measures.

Policies and Programs. The World Population Plan of Action, adopted by consensus at the 1974 World Population Conference in Bucharest, recommends "that Governments consider making provision, in both their formal and nonformal educational programmes, for informing their people of the consequences of existing or alternative fertility behavior for the well-being of the family, for the educational and psychological development of children and for the general welfare of society, so that an informed and responsible attitude to marriage and reproduction will be promoted" (United Nations, 1975, p. 12).

The Plan of Action also states: "Educational institutions in all countries should be encouraged to expand their curricula to include a study of population dynamics and policies, including, where appropriate, family life, responsible parenthood and the relation of population dynamics to socioeconomic development and to international relations" (United Nations, 1975, p. 22).

By the early 1980s there were twelve national school-based projects in operation in Latin America, nine in Africa, six in the Middle East, and eleven in Asia. A larger number of out-of-school activities were in operation, but these have usually been smaller in scope, designed for smaller audiences such as women's groups, cooperatives, employers, trade unions, literacy groups, and others. Examples of projects follow.

In 1973, the Philippines Department of Education organized a population education program (PEP) with content that included relationships between population change and a number of quality-of-life issues, including questions of sexuality and the environment. The program dealt with cultural differences within the country and innovative teacher-training techniques. It has resulted in the introduction of population concepts into school curricula at the primary, secondary, and teacher-training and other university levels.

In Sri Lanka, the Worker's Education Branch of the Department of Labor has developed a population education project for workers that combines family planning and broader population subject matter in response to needs identified by the project's adult audience. The project's early activities were aimed at creating an understanding of population issues among trade union leaders and supervisory staff in industry, in order to enlist their support in developing population education activities for industrial workers.

In the mid-1970s, the Dominican Republic Ministry of

Education and Fine Arts launched a national education reform accompanied by a national population education program. The program involved the introduction of population concepts at all levels of the school curriculum including teacher-training institutions, and the development of population education activities for adults as well. The content included elements of sex education, social demography, family life education, and ecology.

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2.
SEX EDUCATION

The term "sex education" is used to cover a broad range of formal and nonformal educational programs that deal with human sexuality and reproduction. The term encompasses such different matters as premarital counseling, discussions of ethics, media programs on human reproduction, and courses of instruction on human sexual response. Target groups may be radio or television audiences, couples, staff or clients of public or private agencies, or students at any educational level.

Opposition. Although some form of sex education exists in most countries, the topic is often a matter of controversy because it involves public discussion of what many people consider a highly personal matter. The sex practices of a culture are influenced by deep-rooted taboos and sanctions, and some people fear that morals will deteriorate if such matters are discussed openly. As a result, there is often pronounced opposition to the institutionalization of sex education at a national level, and particu-

larly to its introduction to children through the school system.

Despite this opposition, recognition of the need for sex education has been growing throughout the world. In developing countries the push for such programs often stems from a belief in their value for helping young people to make responsible decisions regarding sexuality and to avoid unwanted pregnancies. In a few countries sex education has been promoted as an integral part of government programs to reduce population growth.

Even with a widespread recognition of the importance of sex education, a variety of barriers may hamper the actual implementation of such programs. In some societies, cultural values prohibit discussion of sexual matters. Even where taboos do not exist, controversy may exist concerning who should provide information about sex, at what ages young people should receive such information, and where this education should take place. For example, controversy concerning the age at which sex education should be initiated has led to debates over whether it should be included in primary or secondary schools. In much of the developing world, where the majority of youth do not attend secondary school, the argument has extended to whether in-school or out-of-school approaches are most appropriate. In addition, the content of sex education programs may not be consonant with certain societal values. In societies that proscribe premarital sex, any discussion of sexuality or the reproductive process may be considered inappropriate for unmarried persons. Other sources of opposition may exist in regard to the family limitation message of many sex education programs.

Religious barriers may also impede the implementation of sex education programs. In countries that are religiously heterogeneous, the decision to initiate programs is most often a secular one. Still, religious groups are often vociferous in expressing their opposition toward these programs. In more homogenous societies, religious groups may exert considerable influence over the educational system and may oppose sex education that runs counter to religious teachings.

Sex education may also face political opposition. In parts of Latin America and Africa, it is sometimes perceived as part of foreign-sponsored population control programs. In such circumstances, resistance may be expressed in terms of ideological rejection of imperialism or support of demographic expansion as a way of contributing to national strength.

There are also practical barriers to the development of sex education programs, such as those imposed by lack of financial or other resources. In both developed and developing countries there remain great needs in the areas of the curriculum development and training of teachers.

Opposition to sex education has sometimes resulted in legal challenges to its implementation. The three most common challenges to sex education in the schools center around the following issues: (1) "obscenity", and the charge that sex education will undermine sexual morality; (2) the appropriate role of the state in the conflict between sex education and some religious teachings; (3) whether parental objections to sex education stand in the way of children's rights to receive such information.

Prevalence. The status of sex education programs varies greatly from country to country. In some parts of the world, school-based sex education is mandated by the central government; in others it is officially proscribed in any setting. Most commonly, however, a variety of public and private agencies offer diverse and unconnected programs of formal or nonformal education in matters relating to sex, reproduction, and family planning.

Sweden was one of the first countries to offer sex education in the schools. By 1921 a state commission had already published a complete program for sex education. Other examples of aggressive government support for school-based sex education can be found in eastern Europe. In Yugoslavia such instruction is more common in primary schools than in technical or vocational schools, and in Poland 60 percent of the primary schools offer sex education courses.

In the United States, where the school system is decentralized, the provision of sex education varies from one local area to another, although in general it is more common in high school than in elementary school curricula. A recent national survey of U.S. teenagers aged 15 to 19 indicated that seven in ten of them reported having some form of sex education in school. Another nationwide poll of young people aged 13 to 18 gave a figure of 43 percent. Some states, however, prohibit sex education altogether, and even at the college level, many schools neither provide sex education courses nor offer counseling services to deal with the sexual concerns of students.

In Latin America and Asia the status of sex education in the schools varies from total proscription to active sponsorship. In Argentina sex education is officially forbidden if it includes mention of family planning, and even at the university level, no in-school courses are offered. By contrast, in Mexico elementary school students are introduced to the study of both animal and human reproduction. In some of the Caribbean countries, sex education enjoys both government and popular support and is found within the schools, as well as in other, more innovative formats. A study conducted among males in Trinidad and Tobago indicated that 97 percent favored the provision of sex education covering a broad range of topics.

In East and South Asia strong population pressures,

government support of population control, and little popular objection to the idea of contraception would appear to be conducive to the provision of sex education. Opposition to school-based programs is quite strong, however, and with the exception of the Philippines, Japan, and Taiwan, there have been no attempts in this region to implement in-school sex education on a large scale. Indonesia, for example, has a clear official policy supporting limited population growth. There are strong nonschool family planning information programs as well as in-school population education. However, a pilot course on sexuality was ill received, and the Ministry of Education officially stated that government policy did not promote this type of education. Similar government reluctance to implement sex education programs exists in Bangladesh, Malaysia, Thailand, and India.

In Africa south of the Sahara, sex education has recently begun to receive more attention. An international discussion on sex education in French-speaking Africa was held in Mali in 1973. It was noted that both adults and children need information about human reproduction, but that few teachers are available to impart it. Thus, recommendations were made for instruction on sexuality in African schools and for the training of teachers. However, the range of content of these programs is somewhat limited since in French-speaking countries an old French law still forbids the provision of information about contraception. In English-speaking countries there are no laws limiting the content of sex education in the schools, and more has been done in this field. Both Ghana and Kenya have recently planned to implement in-school programs, and nonschool information programs already exist.

Effects. As in many other areas of education, evaluation of the effects of sex education has largely centered on changes in the knowledge, attitudes, and behavior of recipients. These changes have been measured among young children, clinic populations, college and medical students, teachers or counselors, parents, or other audiences receiving some form of sex education. While this research is not strictly comparable, owing to variations in audience and in the kind of sex education offered to each, some generalizations about effects are still possible.

Knowledge changes. Virtually all sex education programs that have documented effects have been able to demonstrate gains in knowledge about reproductive physiology, sexuality, contraception, or related topics. The methodology for demonstrating such gains is usually to test participants before and after going through the program. Such a measurement strategy is so common that standardized instruments to measure knowledge have been developed and are in widespread use. Most of these measures, however, are for the assessment of short-

term outcomes. Retention of knowledge over long periods is complicated to assess, and, given the diversity of sex education programs in most countries, general and widespread improvement in specific knowledge areas may be difficult to achieve. For example, a national survey in the United States has shown that, among young people who claimed to have had sex education in school, only a third could correctly identify the time of the menstrual cycle when a woman is most at risk of pregnancy.

Attitude changes. As may be expected, the kinds of attitudes that programs may seek to change vary widely. While some stress parenthood, others emphasize tolerance of the sexual orientations of others or liberality about various sexual practices. Interestingly, sex education programs often seem to liberalize attitudes toward the sexual behavior of others but make little change in attitudes toward the participant's own sexual behavior. For example, one program was able to report more liberal attitudes toward homosexuals as a result of a college sex education course but little change in the amount of guilt students felt about their own sexual conduct. For programs that attempt change in the attitudes of professionals who counsel about sexual problems, however, attempts to increase tolerance toward others may be the more important of the two goals.

Behavioral changes. While efforts at sex education have often been ambitious in their attempts to alter the behavior of participants, there is little evidence that such programs by themselves produce behavioral change. Examples of such attempts are national programs to alter reproductive ideals or some school programs designed to reduce the frequency of premarital sexual intercourse. Because of lack of documentation or the relative newness of sex education, or because sex education has no such effect, there is little evidence that sex education affects sexual behavior. There is evidence, however, that sex education may influence less complex behavior such as communication between parents and children about sexuality. Insofar as such communication results in attitude or behavioral change in other areas, there may be an as yet unidentified, indirect effect of sex education.

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3.

TEACHING DEMOGRAPHY

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Historically, the study of population was associated with eighteenth-century political economics as reflected in the writings of Thomas Malthus and the classical economists David Ricardo and Adam Smith and with the study of mortality beginning with John Graunt's bills of mortality. In the nineteenth century, population was therefore most commonly taught in political economy courses and in actuarial science. The latter provided the main information for the growth of government statistical systems, and some teaching of demography (or political arithmetic) took place within statistics offices. As birth and death were considered to be primarily biological processes, medical faculties also began to offer instruction about them, particularly in the areas of epidemiology and the physiology of reproduction. The early work on the mathematics of population in the 1920s and 1930s, by scholars such as Alfred J. Lotka, also placed the study of population, in their terms, within the biological sciences.

Since the end of the nineteenth century, population study has been strongly influenced by the growth of the social sciences, primarily because this growth has coincided with increased voluntary control over fertility. From that time, social explanations of fertility, mortality, nuptiality, and mobility came into prominence. Thus by the 1920s, demography, both from the point of view of teaching and research, stood between the biological and the social sciences. Subsequently, therefore, within these broad areas of knowledge, aspects of demography were variously taught as part of medicine, biology, physical anthropology, public health, genetics, and statistics on the one hand or part of geography, sociology, economics, history, social anthropology, psychology, and even law on the other. Teaching on population emerged at points where particular individuals interested in population were located. While the disbursement of the teaching of demography over a broad range of disciplines presumably led to more rapid growth in the number of courses offering material on demography, it also created a considerable degree of instability as the individuals concerned changed interest or location. While this diversity still exists, with the passage of time, demography has

come to be more frequently identified as a social science. For example, in 1957, UNESCO published a volume on demography in its series on The University Teaching of Social Sciences (Glass, 1957), prepared under the auspices of the International Union for the Scientific Study of Population (IUSSP), the professional association of demographers.

Traditionally, rigid academic structures never welcome new disciplines, particularly those with a broad scope, and so the institutionalization of demography as a separate, academic discipline has proceeded very slowly. Some of the early landmarks in this process have been the international population conference in Geneva in 1927, which gave birth to the International Union for the Scientific Study of Population; the formation of the Population Association of America in 1931; the creation of the Office of Population Research at Princeton University and the publication of its bibliographical journal, *Population Index,* in 1935; and the founding of the Population Investigation Committee in the United Kingdom in 1936 and the publication of its journal, *Population Studies,* in 1947. Landmarks after World War II included the establishment of the Institut National d'Etudes Démographiques in Paris in 1945, followed by publication of its journal, *Population,* beginning in 1946; the founding of the United Nations' Population Division in 1946; and the publication of the first United Nations *Demographic Yearbook* in 1948. Then followed the creation of the first academic department of demography, at the Australian National University, in 1952 and the establishment, in the mid-1950s, under the auspices of the United Nations, of the International Institute for Population Studies in Bombay and the Centro Latinoamericano de Demografía in Santiago.

Despite these milestones, most teaching of demography still takes place outside specific demographic institutions. Teaching of demography within demographic institutions is more common at the graduate level and in Third World countries, where academic structures are not so rigid. This means that the present state of the teaching of demography needs to be considered in terms of two dimensions, level and context. The level of teaching may range from insertion of selected aspects of demography in government-sponsored population educational programs for the general public and courses in primary and secondary schools, to more academic training at the undergraduate, graduate, or technical levels. The context of the teaching refers to the disciplinary setting in which the teaching takes place. The location of any given teaching program on this two-dimensional plane depends on the objectives of the program and the teaching structure in existence at the time and place that the program was contemplated.

A further problem in discussing the teaching of demography is simply that of defining whether any given course is actually a course in demography. It is very common for a block of lectures on aspects of population to be given within a wide range of courses in many disciplines and, while the quality of these lectures is a matter of concern to the demographic profession, these courses themselves would not be regarded as courses in demography. The situation is less clear, however, in respect to courses such as population geography or the sociology of fertility where the lecturers themselves may differ as to whether they consider their course to be primarily training in geography, sociology, or demography. Clearly, the arbitrary drawing of academic boundaries is a fruitless task. It is, therefore, more productive to examine the teaching of demography from a more positive viewpoint, that is, in terms of the objectives of any given course.

For most practical purposes, there are four broad categories of objectives in the teaching of demography, independent of institutional arrangements: (1) training of professional demographers or population studies specialists; (2) instruction in demography as a subfield in the training of professionals in other disciplines; (3) instruction in selected aspects of demography as part of education at the high school level; and (4) incorporation of selected concepts of demography as part of population educational or informational activities for the broader public. The professional training of demographers includes those activities, whatever their level, in universities, academic centers, training centers or other national or international institutions, that have the aim of training persons recognized as competent to conduct specialized work in the field of population studies. Previously this category was subdivided into formal, academic education and courses for technicians, but this division is becoming less relevant with the overall rise in educational standards. Demography as a subfield in the training of professionals in other disciplines refers to teaching activities conducted on a regular basis in established institutions as part of the curriculum in those disciplines.

Professional Demographers. Investigations of the situation in respect of the teaching of demography from the institutional viewpoint have concentrated on the first and last of these objectives, that is, the formation of professional demographers and population education. The IUSSP as the international association of demographers, has understandably focused its attention over the years on the training of professional demographers. In the early 1950s, the IUSSP set up a Committee on Instruction in Demography. One function of this committee was to investigate the particular aspects of the organization and teaching of demography in university faculties and scientific institutions. The countries asked to provide in-

dividual detailed reports to that inquiry were Australia, France, Hungary, Italy, Japan, the Netherlands, the United Kingdom, the United States, and Yugoslavia. These were the countries in which the teaching of demography was most developed. Regional reports were obtained for East and West Germany, Austria and Switzerland, Latin America, Southeast Asia and the northern European countries, indicating some, but very limited, teaching of demography. In effect, the teaching of demography was poorly developed, except in western Europe and the United States, and was almost nonexistent in Third World countries. In addition, virtually all of the teaching was outside specialized, demographic organizational structures, even though the report concluded that there was no reason, other than the actual structures and traditions of most universities, why the advanced study of demography should not be developed as a separate discipline in a separate department (Glass, 1957, p. 54). The report considered that the subordination of demography exclusively to one comprehensive discipline, say either sociology or statistics, ran the risk of producing demographers who were too narrowly specialized. In this context, particular mention was made of the growing concentration of demography in sociology departments in the United States; but it was conceded that, because of the particular way in which sociology had developed in the United States, it may well have provided a more appropriate frame for demography than any other discipline.

Since the mid-1950s, the teaching of demography as a separately organized discipline has expanded in most parts of the world, particularly in Third World countries. In the United States, however, demography has continued to expand primarily within sociology departments. A recent list of universities in the United States with graduate departments emphasizing demography showed that, in virtually all instances, demography was taught within a sociology department (Haupt and Kane, 1978). This difference in trend between the United States and other countries is important because about 30 percent of the membership of IUSSP comes from the United States and a considerable proportion of the total teaching of demography takes place there. Some people prefer the situation in the United States because they think that sociology should be pervaded by demography and vice versa; others think that the present arrangement is merely a matter of convenience, while still others, like John C. Caldwell, consider that no real fusion has been achieved between demography and sociology courses in the United States and that the situation where many demographer-sociologists have intellectual feet in both camps "is a strong force for inertia in the development of demography" (Caldwell, 1973, p. 127). One of the difficulties in this

regard is the fact that demography is a small, specialized discipline, albeit a most important one. Ideally, therefore, the professional training of demographers would take place in strong, broadly based demographic institutions; but academic structures and the demands of the competitive market place for students often preclude achievement of this ideal.

Surprisingly, there is less disagreement on the broad content of a course intended to produce professional demographers. Usually such a course is seen to have three essential components: (1) it must give particular attention to the sources, collection, and evaluation of demographic data; (2) it must provide training in the methods of formal demographic analysis; and (3) it must provide the student with an understanding of the biological, historical, economic, and social contexts in which demographic processes take place. At a more advanced level, specialization within one or more of these three components would take place. In addition, emphasis would be placed on writing a report or thesis in circumstances where students lack experience in these skills. It is generally no longer possible for demographers to be purely technicians; rather, their reports are expected to reflect the social and economic context of their work.

Lists of institutions providing training for professional demographers are produced from time to time by a range of organizations such as the Population Association of America, IUSSP, UNESCO, the Population Reference Bureau, and the Economic and Social Commission for Asia and the Pacific (ESCAP); but this is a volatile area and programs are subject to high birth and death rates. A good compilation of centers of population study is that of the Committee for International Cooperation in National Research in Demography (1980).

Other Professionals. With regard to the teaching of demography to professionals in other disciplines, the chief concern has always been the nature of the relationship between demography and the particular discipline concerned. Philip D. Hauser and Otis Dudley Duncan (1959) provided an early example of this kind of activity, while the IUSSP Committee on the Teaching of Demography and Training in Population (1969–1974) also devoted much attention to this question in an unpublished series of papers. The fact that demographers have put so much effort into establishing the relationship between their discipline and an unusually wide range of other, more comprehensive, disciplines not only reflects the interdisciplinarity of the subject, but also indicates the struggle for professional status that has often faced population specialists. The central issue arising in this area of teaching is whether professionals in other disciplines should receive a straight course in demography and gain thereby a broad appreciation of the field or whether the

course should be designed to focus only upon those areas of demography of very direct relevance to the particular discipline. This is, of course, not an issue confined to demography. It applies wherever specialists in one discipline require training in another discipline. In general, in institutions catering to a broad range of disciplines, it has not been considered appropriate to provide a proliferation of courses such as Sociology for Economists or Economics for Sociologists, but rather for specialists in one discipline to take full courses in the other. In the instance of the teaching of demography to specialists in another discipline, however, the teaching is frequently done within the bounds of that discipline. It is more likely therefore that demography courses will be tailored to meet the specialized needs of the other discipline. In these circumstances, it can be argued on the one hand that specialists in other disciplines may obtain a distorted view of demography, while on the other hand it might be said that they obtain a greater appreciation of demography as they see it in the light of their own discipline.

High School Students and the General Public. Examples of the teaching of demography as a science in high schools are very rare. The Belgian Demographic Society has produced a seventy-page textbook for use in high schools (Masuy-Stroobant, 1974). More common are attempts to introduce population education or information programs in high schools, particularly in Third World countries with strong population policies. In these situations, an understanding of the government's policies is ordinarily given in geography or civics courses.

Population education, however, has a broader content base and objectives that are different from those of the more academic courses discussed so far, and it should probably not be classified with the teaching of demography. In actuality, while demographers have provided factual information for population education programs, population education as such falls within an area generally outside the training of professional demographers. Moreover, population education specialists are usually not demographers. The demographic profession, however, has a considerable interest in assessing the validity of the content of population education programs. [*See* EDUCATION, *article on* POPULATION EDUCATION.]

Conclusions. Demography is a relatively new field still finding its place in the educational environment of older disciplines. Although a small, specialized discipline, it has relevance to a very broad range of other disciplines. In these circumstances, the teaching of demography has emerged in many shapes and forms in various parts of the world. Increasingly, however, there is a tendency to set up specialized departments or institutes of demography. This trend is well developed in Third World countries and is becoming more established in Europe, Can-

ada, and Australia. In the United States, however, demography remains primarily within the discipline of sociology.

The rapid spread of demography and the variations in the way it is taught and in the purposes of much instruction have led to difficulties in the preparation of teaching materials, particularly textbooks. This problem has been exacerbated by the lack of attention given to translation of population materials into the language of instruction of particular courses. Moreover, the struggle to establish institutional bases for the teaching of demography has tended to draw attention away from the issues of teaching itself, such as curriculum development. In the future, greater attention will need to be focused on these issues as the institutional base of demography becomes more secure.

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EMIGRATION

See MIGRATION.

EMPLOYMENT

See LABOR FORCE.

ENUMERATION SYSTEM

See DATA COLLECTION.

ENVIRONMENT

See ECOLOGY; RESOURCES AND POPULATION.

EPIDEMIOLOGIC TRANSITION

1. Theory   Abdel R. Omran
2. United States   Abdel R. Omran

1.
THEORY

Epidemiologic transition theory focuses on the complex changes in patterns of health and disease in a society and on their demographic, socioeconomic, and biologic determinants and consequences. During the transition, pandemics of infection are gradually displaced as causes of morbidity and mortality by degenerative, stress-related, and man-made diseases. This transition is associated in varying degrees with social, economic, and medical developments. The changes in patterns of disease result in shifts in the average age at death, from infancy, childhood, and young adulthood to older ages, with corresponding increases in life expectancy. These improved chances of survival selectively favor the young more than the old, and women more than men, resulting in changes in the age and sex structure of the population. The declines in mortality that are central to the epidemiologic transition usually widen the gap between birth rates and death rates with the course of population growth becoming increasingly sensitive to changes in fertility levels. The pattern, pace, and dynamics of these transitional changes vary in different historical, political, socioeconomic, and cultural settings. Thus, the formulation of several models of the epidemiologic transition for nations at different levels of development provides a basis for plausible and locally relevant predictions of future changes in population and health factors.

Propositions of the Theory. The theory of epidemiologic transition consists of five propositions.

Proposition 1. The theory begins with the major premise that mortality is a fundamental factor in population dynamics.

Proposition 2. The second proposition is that during the transition, a long-term shift occurs in mortality and disease patterns whereby pandemics of infection are progressively (but not completely) displaced by degenerative and man-made diseases as the leading causes of death. Typically, mortality patterns distinguish three major stages of the epidemiologic transition. (1) *The age of pestilence and famine,* when mortality is high and fluctuating, thus precluding sustained population growth. In this stage the average life expectancy at birth is low and variable, vacillating between 20 and 40 years. (2) *The age of receding pandemics,* when mortality declines progressively as epidemics decrease in frequency and magnitude. The average life expectancy at birth increases steadily from

about 30 to 55 years. Population growth is sustained at high rates as the gap between birth rates and death rates widens. (3) *The age of degenerative and man-made diseases,* when mortality continues to decline and eventually approaches stability at a relatively low level. The average life expectancy at birth rises gradually until it exceeds 70 years. It is during this stage that fertility becomes a crucial factor in population growth.

Proposition 3. The third proposition is that the epidemiologic transition usually favors the young over the old and females over males. In other words, the improvements in survivorship that occur with the recession of pandemics tend to benefit women in the reproductive age groups rather than men. While the transition benefits all social classes, the class differential in mortality is usually maintained, notwithstanding that the pace of change is faster and the takeoff is earlier for the affluent and more privileged than for the poor and the disadvantaged members of a population.

Proposition 4. According to the fourth proposition, the shifts in health and disease patterns that characterized the epidemiologic transition prior to the twentieth century (i.e., in the more-developed countries) have a closer association with rising standards of living and improved nutrition than with medical progress. In contrast, the twentieth-century transitions (i.e., in the less-developed countries) are initiated by medical progress, organized health care, and disease control programs that are usually internationally assisted and financed, and thus largely independent of the socioeconomic level of the country. Further maturation of the transition, however, depends on a beneficial synergy of health care progress and socioeconomic development. Likewise, the fertility transition prior to the twentieth century was largely determined by social and economic progress in countries that were more or less familiar with traditional methods of fertility control. These methods, as well as rising age at first marriage, were the major intermediate variables for fertility reduction. The more recent fertility decline in some developing countries, on the other hand, has been dependent on organized efforts of family planning in conjunction with socioeconomic development.

Proposition 5. According to the fifth proposition, distinctive variations in the pattern, the pace, the determinants, and the consequences of population change differentiate four basic models of the epidemiologic transition: (1) the classical or Western model, (2) the accelerated variant of the classical model, (3) the delayed model, and (4) the transitional variant of the delayed model.
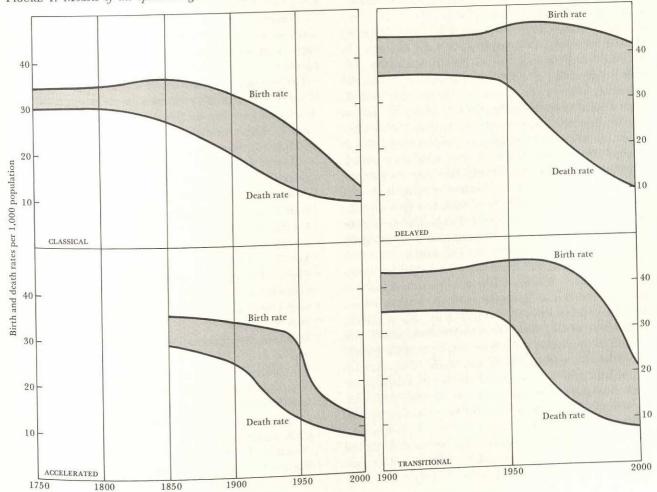
Basic Models. The characterization of these models is of significance to both population theory and practical policy applications. They are demonstrated schematically in Figure 1.

Classical or Western model. The classical or Western transition model describes the shift in Western societies over the past two hundred years from high death rates (about 30 per 1,000 population per year) to low death rates (under 10 per 1,000) and low birth rates (under 20 per 1,000). Mortality declined gradually in response to social, economic, and environmental improvements that constitute the modernization complex and include better nutrition and personal health habits. During the transition, epidemics receded and communicable diseases were replaced gradually, but not totally, by degenerative, stress-related, and man-made diseases, with corresponding improvement in life chances, especially for children, young adults, and females of reproductive age.

Typically, the mortality transition passed through the three stages described in Proposition 2: (1) an early stage of pestilence and famine, which was the extension of medieval or preindustrial disease patterns, (2) an intermediate stage of receding pandemics in the middle or latter part of the nineteenth century, (3) then, in the twentieth century, a stage of degenerative and man-made diseases (such as those related to radiation, motor vehicle and industrial accidents, food additives, occupational hazards, and environmental pollution). In the early stages, mortality shifts owed little to medical measures, which were at best modest and greatly limited, in contrast to shifts of the twentieth century, which benefited greatly from medical progress.

With further maturation of the epidemiologic transition during the third phase, some of the degenerative and man-made diseases may come under control depending on the state of medical knowledge, health care technology and its use, the life style of the people, and environmental changes. Other degenerative and man-made diseases may gain higher prominence and replace the waning diseases as leading causes of death. For example, coronary or ischemic heart diseases rose in epidemic fashion in the more-developed countries during the twentieth

FIGURE 1. *Models of the epidemiologic transition*

century. In the late 1960s some countries showed signs of decline in this category of diseases either from decrease in the risk factors (hypertension, high-cholestrol diet, sendentary style of activity) or from early diagnosis, prompt treatment, and intensive care. This decline may depress overall mortality to some extent. But, since other diseases are rising, particularly cancer of the lung, the net gain in life expectancy is small. Communicable diseases, even in this third stage of the transition, are not totally out of the picture. Some may linger on as causes of death (such as the pneumonia-influenza-bronchitis complex) or as causes of morbidity and disability (such as venereal diseases) while new ones may develop as a result of mutation or changing virulence or organisms (such as Legionnaire's disease).

As mortality approaches very low levels, incremental improvements in life expectancy at birth become harder to achieve. The decline in mortality may come to a standstill or even be reversed temporarily. Further gains against mortality depend on several factors including improved and equitable access to good medical care at an affordable cost, rising standards of living, healthy habits and life styles, better control of the environment, and advances in medical technology.

Fertility decline in this Western model was also gradual and occurred fifty to seventy-five years after mortality declined. This sequence of fertility declining only after the mortality decline was well under way was not universal, however. In France and in parishes in some other European countries fertility and mortality declines almost coincided. Furthermore, in several societies belonging to this model, fertility initially increased before it declined. Fertility decline, when it occurred, was precipitated by social changes in societies that were more or less familiar with methods of fertility regulation. Social norms relating to the practice of fertility regulation and delay in the age at marriage were the basis for the decline rather than organized service programs. Induced abortion played only a minor role in this model.

Finally, because the dynamics of the Western transition were closely related to the unique characteristics of the industrial and social revolution in the West, it is clear that the experience in this model is not automatically transferable to the less-developed countries of today, as is sometimes implied in the demographic transition theory.

Accelerated variant of the classical model. The transition in Japan, Eastern Europe, and the Soviet Union is described by the accelerated variant of the classical model. In this model the mortality transition occurred over relatively short periods of time. In most of these countries a slow process of modernization had begun prior to the drop in mortality in the twentieth century, which was determined by general social improvements as well as by

sanitary and medical advances. Wide use of abortion helped accelerate the fertility transition.

Delayed Model. Changes that have been observed in most of the Third World countries are described by the delayed model. In these areas mortality has declined dramatically since the end of World War II, while fertility has been sustained at high levels. Unlike the classical model, mortality decline in the developing countries has been substantially influenced by modern medical technology made available through bilateral or international cooperation. This has included mass use of chemotherapeutic agents, antibiotics, and insecticides, as well as malaria-eradication programs assisted by the World Health Organization, maternal and child health programs and nutritional-improvement programs. These developments have succeeded in substantially reducing mortality and have outpaced the slower rise in standards of living. The initial mortality decline was much faster than the equivalent stage in the classical model. Life expectancy increased rapidly from about 40 years to 50–55 years in the 1960s. This level of life expectancy seems to have been the turning point, after which mortality decline slackened, especially in regard to infant and child mortality. This may be because there is a limit of what can be achieved without genuine improvement in the medical care system in the context of social and economic development.

Further mortality decline in less-developed countries, especially in regard to infant and child mortality, will depend on the progress made in supplementing the imported medical technology with genuine health care and social development including the following:

- Reorientation of health programs from hospital-based curative systems toward community-based total care (both preventive and curative) systems with emphasis on primary care
- Improved management and efficiency of health programs
- Health education to change patterns of life that are detrimental to health
- Improved training and motivation of health and community workers
- Community participation in health and welfare programs
- Environmental control and sanitation
- A political and economic structure responsive to the health needs of the population
- Progress in public services such as schooling and road construction
- A rise in the standard of living
- Equitable access to good health care for the poor and disadvantaged especially in rural areas.

Finally, it is worthy of note that the decline in mortality in less-developed countries has not eliminated the differential among social groups.

Transitional variant of the delayed model. A description of the transition in a number of developing countries such as Taiwan, South Korea, Singapore, Hong Kong, Sri Lanka, Mauritius, Jamaica, probably China, and others is provided by the transitional variant of the delayed model. In these countries mortality declined rapidly in the 1940s in a manner similar to that in the delayed model. These countries were more fortunate however in two respects. First, a few decades after the mortality decline, fertility started to decline as well in response to efficient, organized, family planning efforts supplemented by social development. Second, the mortality decline, especially in regard to infant and child mortality, did not slacken to the same extent as in the delayed model, because of the satisfaction of several of the prerequisites noted above. The gap in the health levels between the countries in this model and those in the classical model is narrowing.

As a final note, I should emphasize that the changes during the transition have a great impact on population composition and on the pattern of population growth. Whereas the more-developed countries belonging to the classical and accelerated models experienced only low to moderate rates of population growth during the transition, the less-developed countries in the delayed model are experiencing growth rates of 2.0 to 3.5 percent per year. At this rate the populations of those countries will double in twenty to thirty years. In the countries in the transitional variant of the delayed model, this growth has been slowed by the initial fertility decline. Fortunately, China, with more than one billion people, is apparently a part of the transitional variant. Despite the promising indications of the onset of fertility decline in a growing number of less-developed countries, the large gap that has developed between fertility and mortality in countries that have recently experienced the second stage of the epidemiologic transition assures that the unprecedented growth of world population will continue for some time to come.

Abdel R. Omran

See also MORBIDITY AND LONGEVITY; MORTALITY; PUBLIC HEALTH.

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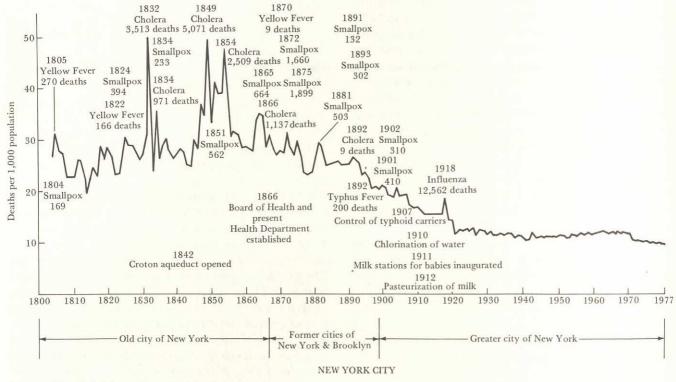
2.
UNITED STATES

The concepts of epidemiologic transition theory provide a framework to describe population and health dynamics in the United States during the nineteenth century. Such a characterization requires long-term data, which unfortunately are lacking for the United States as a whole. Thus, data from one state, Massachusetts since 1800, and from a major metropolis, New York City since 1804, are used to supplement United States data, with due caution against generalizing from local to national situations. An examination of such data places the United States experience in the classical model of epidemiologic transition (Omran, 1971, 1977), where infectious diseases are largely (but not completely) replaced by degenerative and man-made diseases as leading causes of morbidity and mortality and where fertility declines after a substantial lag.

The Mortality Transition. Judging from the limited and uneven data available, mortality in the United States in the eighteenth century and until the mid-nineteenth century was generally high with fluctuations in epidemic years. The level was highest among nonwhites and in southern states. Mortality also was higher in crowded urban areas than in rural areas. Thus, burial records from Boston suggest an overall mortality rate of 33 per 1,000 among whites and 70 per 1,000 in the slave population. Life expectancy calculated for 1798 for Massachusetts and New Hampshire was no more than 35 years (Taeuber and Taeuber, 1958).

During the nineteenth century, the available data suggest varying levels of mortality in different areas. Mortality records for Massachusetts indicate a rate of 27.8 per 1,000 white population in 1789, which dropped steadily to 17.3 per 1,000 around 1900. In New York City, the mortality profile between 1804 and 1900 (Figure 1) indicates that the level of mortality was much higher than that among the white population of Massachusetts. In addition, while the life expectancy at birth for white males was 44 years in Massachusetts and 46 in New Jersey, it was 40 or fewer in Philadelphia and the District of Columbia and only 34 in the cities of New York, Charles-

FIGURE 1. *Mortality transition in New York City*

SOURCE: New York City, n.d.; updated by the author.

ton, and New Orleans. The corresponding life expectancy for black males was even lower.

From the above data, uneven as they are, it is not unreasonable to infer that the level of mortality for the country as a whole (the weighted average of different levels) lay somewhere between that of Massachusetts and that of New York City. Furthermore, the mortality decline in the United States most probably started around the middle of the nineteenth century with earlier and more rapid declines among the white and the affluent than among the nonwhite and the disadvantaged.

Data for the United States between 1890 and 1977 (see Table 1) demonstrate a continuing decline (interrupted only by the influenza pandemic of 1918–1919). These

TABLE 1. *Crude and age-adjusted death rates (using U.S. population, 1940, as standard) by race and sex, United States, 1890–1977*

	Crude death rate				Adjusted death rate			
	White		Nonwhite		White		Nonwhite	
Year	Males	Females	Males	Females	Males	Females	Males	Females
1890	20.2	18.0	31.6	28.3	23.8	20.9	40.0	34.2
1900	17.7	16.3	25.7	24.4	18.4	16.8	28.7	27.1
1910	15.4	13.6	22.3	21.0	16.7	14.4	24.8	23.2
1920	13.0	12.1	17.8	17.5	14.2	13.1	20.4	21.0
1930	11.7	9.3	17.4	15.3	12.8	10.6	21.0	19.2
1940	11.6	9.2	15.1	12.6	11.6	8.8	17.6	15.0
1950	10.9	8.0	12.1	9.9	9.6	6.5	13.6	10.9
1960	11.0	8.0	11.5	8.7	9.2	5.6	12.1	8.9
1970	10.9	8.1	11.2	7.8	8.9	5.0	12.3	7.7
1977[a]	9.9	7.8	9.6	6.7	8.0	4.4	10.7	6.4

[a]Figures for 1977 were calculated from U.S. Bureau of the Census, 1980, table 1, and from U.S. National Center for Health Statistics, 1980, part A, table 1-2, and part B, table 7-3.
SOURCE: Omran, 1980, table 2; reprinted by permission.

data show that (1) whites have experienced lower mortality than nonwhites, and in each racial group females have experienced lower mortality than males; and (2) before 1940 the adjusted rates were higher than the crude rates, while the reverse is true for the white population after 1940. This reversal is the result of the shift in the proportions of susceptible age groups.

Further support of the declining trend of mortality comes from the changes in life expectancy. Life tables are available for the United States since 1900. At that time, life expectancy at birth was 46.6 years for white males, 48.7 for white females, 32.5 for nonwhite males, and 33.5 for nonwhite females. By 1970, the respective figures increased to 68.0, 75.6, 61.3, and 69.4.
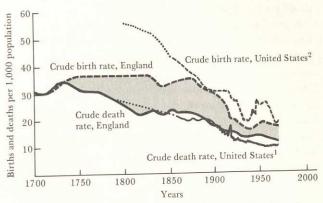
Trends in infant and maternal mortality are worthy of special mention. The infant mortality rate per 1,000 live births dropped in Massachusetts from 131.1 in 1851–1854 to 22.8 in 1950–1954. For the United States, national data became available in 1915 when the rate was about 100 per 1,000. The rate has since declined to about 13.8 in 1978. The maternal mortality rate also has dropped phenomenally during the twentieth century. From over 600 per 100,000 live births in 1915, it decreased to only 9.6 per 100,000 in 1978 (U.S. Bureau of the Census, 1980*b*).

The Fertility Transition. Available data on fertility during the nineteenth century and earlier are suspect. It is probable, however, that fertility was very high prior to the middle of the nineteenth century; Alfred J. Lotka once estimated the intrinsic birth rate at the end of the eighteenth century at 54 per 1,000 population (Lotka, 1927). It should be noted that fertility in the United States before 1850 was much higher than in Europe; in those early days large families were required to populate the vast reaches of the western states and territories and were in accord with the agrarian character of the immigrants.

A series of birth rates available for the Massachusetts white population since 1800 starts at 55 per 1,000 in 1800 and decreases to 30.1 in 1900. These data are used in Figure 2 to approximate fertility trends in the United States. It is unlikely that the birth rate was much higher than 55 per 1,000 in the early part of the century, even for the underprivileged. A downward trend became visible throughout most of the first half of the twentieth century, reaching 19.7 per 1,000 among whites and 28.4 among nonwhites in 1945. For both groups, the rates then increased with a peak in the 1950s (due to the baby boom) and then declined again in the 1960s.

Stages in the American Epidemiologic Transition. A long-term shift in mortality and fertility occurs in classical epidemiologic transition. This change is typically classified into three stages: (1) the age of pestilence and

FIGURE 2. *Mortality and fertility transition in the United States and England*

[1] Before 1900, Massachusetts, white only.   [2] Before 1909, white only.

SOURCE: Omran, 1980, fig. 4; reprinted by permission.

famine, when mortality is high (over 20 per 1,000), life expectancy is low (30–35 years), infection leads the causes of death, and fertility is high (over 35 per 1,000); (2) the age of receding pandemics, when mortality declines gradually in response to recession of major epidemics, life expectancy increases (40–50 years), and fertility is sustained at a high level and then declines after a lag of several decades; and (3) the age of degenerative and man-made diseases, when mortality and fertility continue their decline, while degenerative and man-made diseases lead the causes of morbidity and mortality, and life expectancy exceeds 70 years.

The age of pestilence and famine. Data from New York City since 1804 seem to describe an almost complete transition during the nineteenth and twentieth centuries. Evidence indicates that the mortality decline in the United States as a whole occurred earlier than in New York City.

In New York City, the pattern of mortality during the first half or three quarters of the nineteenth century reflects violent and repeated epidemics in the early stage of the transition (see Figure 1).

In the United States, although no similar documentation for this time period is available, scattered accounts of epidemics leave no doubt of their existence in the eighteenth century and parts of the nineteenth. When first recorded, these diseases were grouped as "zymotic" and "miasmatic" types and included cholera, croup, diarrhea, diphtheria, dysentery, erysipelas, intermittent fever (probably malaria), typhoid, influenza, measles, parotitis, scarlatina, smallpox, syphilis, thrush, whooping cough, and yellow fever. Consumption (tuberculosis), pneumonia, and bronchitis were grouped under respiratory diseases. In the census of 1850 for a number of states

and large cities, mortality information showed that these zymotic and miasmatic diseases were responsible for about half of the deaths (Rosen, 1975).
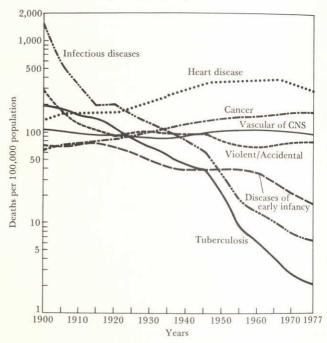
A peculiar characteristic of the early American transition is the virtual absence of "manifest" famine. Yet some forms of malnutrition and undernutrition were prevalent among the slaves and among the slum dwellers in large cities, and these lacks continued among the poor and disadvantaged portions of the population. An indication that the nutrition situation was worse than expected is found in Robert Hunter's 1904 study of poverty in New York City, which estimated that some sixty or seventy thousand children went to school hungry. Rickets was highly prevalent among children during the nineteenth and early twentieth centuries, especially among blacks, Italians, and other children in urban slums. Although rickets is a deficiency disease and is nonfatal by itself, its attendant complications did contribute to high mortality and morbidity. Pellagra, another deficiency disease, was prevalent in the South throughout the early decades of the twentieth century. In 1930 it was still the tenth highest cause of death in North Carolina (Omran, 1975).

The age of receding pandemics. From about the middle of the nineteenth century through the first two decades of the twentieth, the age of receding pandemics prevailed in the United States. During this period of substantial mortality decline, epidemics receded progressively. As demonstrated in Figure 1, peaks of mortality became lower and less frequent.

The age of degenerative and man-made diseases. The third stage of classical epidemiological transition started in the United States (and New York City) during the second or third decade of the twentieth century. At this time, diseases such as heart disease, cancer, stroke, diabetes, and nephritis became increasingly prominent causes of death, displacing pandemics of infection. Man-made diseases such as radiation injury, mental illness, and drug dependency also increased, as did such man-made causes of death as traffic accidents and occupational hazards. Because of the shift from infectious diseases (the killers of the young) to degenerative diseases (the afflictions of later years), life expectancy correspondingly increased. Thus the mortality rates for most age groups declined except in the older age groups.

Shifts in Cause-of-death Patterns. In the United States between 1890 and 1977, mortality rates from infectious disease declined markedly, and mortality rates from heart disease and cancer increased (see Figure 3). (Since 1968, a small decline in mortality from coronary heart diseases has been noted.) Mortality rates from violent causes and accidents rose sharply until the 1930s and remained at a high level after a small decline in the early 1940s. The rates for death due to accidents other than

FIGURE 3. *Trends in major causes of death in the United States, 1900–1977 (semilogarithmic scale)*

SOURCE: Omran, 1980, fig. 9; reprinted by permission.

motor vehicular generally declined, with considerable fluctuations from year to year.

The relative toll of different causes of death in the United States changed radically from 1900 to 1970. The proportion of total deaths due to communicable diseases was extremely high in 1900 (52 percent); seventy-seven years later it had dropped to 6 percent. On the other hand, the proportion of deaths due to heart disease increased from 8 percent in 1900 to 37 percent in 1977. As for cancer, its proportional mortality increased from 4 percent in 1900 to 18 percent in 1977. Both whites and nonwhites contributed to these changes in the disease pattern, with the changes among nonwhites occurring at a relatively slower rate.

Another way of documenting epidemiologic transition is to examine the changes in the ten leading causes of death. Table 2 gives data for New York from 1866 to 1979 and for the United States from 1900 to 1976. Infectious diseases, headed by tuberculosis and the influenza-pneumonia-bronchitis complex, led the causes of death in New York City and the United States until the 1920s. They have since been replaced by heart diseases, cancer, and stroke, which have become the most fatal triad of diseases in the United States (and the rest of the Western world as well).

Inequality of Epidemiologic Transition. Theoretically, mortality decline in the classical model of epidemiologic

TABLE 2. *Ten leading causes of death in New York City, 1866, 1901, 1979, and in the United States, 1900, 1930, 1976*

New York City		United States	
Rank	Percentage	Rank	Percentage
1866		**1900**	
1. Tuberculosis (all forms)	19.8	1. Pneumonia–influenza–bronchitis	14.4
2. Diarrhea and enteritis	15.0	2. Tuberculosis (all forms)	11.3
3. Cholera	6.4	3. Diarrhea and enteritis	8.1
4. Pneumonia–influenza–bronchitis	6.1	4. Heart disease	8.0
5. Infantile convulsions	5.9	5. Bright's disease (chronic nephritis)	4.7
6. Cerebral hemorrhage	2.7	6. Accidents	4.5
7. Diphtheria and croup	2.7	7. Congestion and hemorrhage of brain	4.2
8. Dysentery	2.7	8. Early infancy	4.2
9. Scarlet fever	2.5	9. Cancer and other malignant tumors	3.7
10. Nephritis	2.4	10. Diphtheria	2.3
1901		**1930**	
1. Pneumonia–influenza–bronchitis	17.2	1. Heart disease	18.9
2. Tuberculosis (all forms)	13.2	2. Pneumonia–influenza–bronchitis	9.4
3. Diarrhea and enteritis	9.5	3. Cancer	8.6
4. Nephritis	7.7	4. Nephritis (all forms)	8.0
5. Heart disease	7.1	5. Cerebral hemorrhage	7.1
6. Cerebral hemorrhage	3.6	6. Tuberculosis (all forms)	6.3
7. Violent and accidental	3.6	7. Accidents (except motor vehicle), suicide	5.5
8. Malignant neoplasms	3.5	8. Diseases of early infancy	4.4
9. Diphtheria	2.9	9. Motor vehicle accidents	2.4
10. Congenital debility	2.4	10. Diarrhea and enteritis	2.3
1979[a]		**1976**[b]	
1. Heart disease	43.3	1. Diseases of heart	37.9
2. Malignant neoplasms	22.4	2. Malignant neoplasms	19.8
3. Cerebrovascular diseases	5.3	3. Cerebrovascular diseases	9.9
4. Influenza and pneumonia	3.5	4. Accidents (except motor vehicle), suicide	6.7
5. Cirrhosis of liver	3.0	5. Influenza–pneumonia–bronchitis	3.2
6. Homicides	2.5	6. Diabetes mellitus	1.8
7. Accidents	2.0	7. Cirrhosis of liver	1.6
8. Diabetes mellitus	2.0	8. Arteriosclerosis	1.5
9. Diseases of early infancy	1.4	9. Diseases of early infancy	1.3
10. Arteriosclerosis	1.1	10. Bronchitis	1.3

[a]Data calculated from New York City, n.d., table 5. [b]Data from U.S. National Center for Health Statistics, 1979, part A, table 1-5.
SOURCE: Omran, 1980, table 5; adapted by permission.

transition favors children over adults and females over males. In the United States, the transition also favored whites over nonwhites.

Transition by age. Age-specific death rates for the United States since 1890 demonstrate that while all age groups benefited from the transition, the greatest mortality decline occurred in the younger age groups.
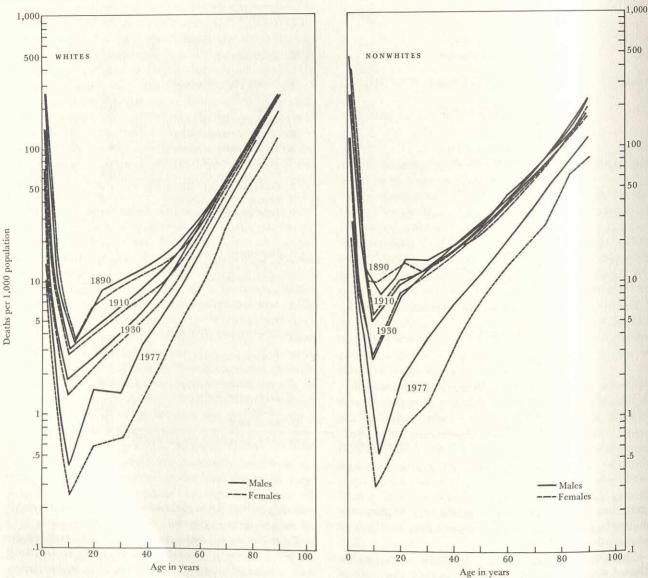
Transition by sex and race. In a previous study of the transition in North Carolina (Omran, 1975), it was found that in 1880, when the leading causes of death were infec-

tious diseases (aided by undernutrition), both white and nonwhite females experienced higher mortality rates during the para-adolescent and the childbearing age spans than did males. By 1930, females in North Carolina (especially white females) showed consistently lower mortality at all ages than did males.

For the United States since 1890, the higher risk of mortality for females was evident only among nonwhites from 1890 through 1910 (see Figure 4). Among whites, this sex differential in mortality was minimal, indicating that the transition among whites occurred at an earlier date and at a faster pace than among nonwhites. In the twentieth century, the relative risk of mortality for the white female already was lower than that for the white

male. Thereafter, the gap between male and female mortality risks has widened, while the difference in mortality between nonwhites and whites had decreased.

Although the etiological factors underlying the sex differential are uncertain, prevailing diseases and life styles may give some clues. In the nineteenth century and earlier, when the leading causes of death were infectious diseases (aided by undernutrition), females were more affected than males. It is also well known that life styles of women have changed markedly; mechanization of housework, improved housing, and modern techniques of food packaging and merchandising have all helped simplify the housewife's arduous role. With decreased fertility, women were less susceptible to diseases and condi-

FIGURE 4. *White and nonwhite death rates by age and sex, United States, 1890, 1910, 1930, 1977*

SOURCE: Omran, 1980, fig. 12; reprinted by permission.

tions of pregnancy. Better prenatal and natal care and an increase in the age at first pregnancy also have contributed to the sex mortality differential.

Determinants of Mortality Decline. Consistent with the classical model of epidemiologic transition, mortality decline in the United States during the nineteenth century was due primarily to social, economic, and environmental improvements that constitute the modernization complex. In the early stages such declines owed little to either medical progress or organized health programs. This is in contrast to the decline in the twentieth century, which was more strongly influenced by progress in medicine and public health. A sevenfold look at historical facts and events of the nineteenth century will corroborate this proposition.

1. The "miracle drugs," including antibiotics, chemotherapy for infectious diseases, chemotherapy for cancer, and new drugs against hypertension, were not available in the nineteenth century.

2. Active immunization was limited to that for smallpox. The rabies vaccine was developed by Louis Pasteur in 1884–1885 and may have been used in a few cases in the United States. Passive immunization by serum containing antibodies began to be used against diphtheria toward the end of the century, but active immunization using the diphtheria toxoid was not introduced until the 1900's.

3. Sanitation programs were late in coming. In 1890, no more than 1.5 percent of the urban population in the United States was supplied with filtered water. Public water supplies were not chlorinated until 1908. It is possible, however, that increasing proportions of the population obtained clean water from streams and wells that were protected from contamination. Sewage systems were underdeveloped, but individual families may have had some safe method of disposing of waste. Pasteurization of milk was introduced only in 1909, although occasionally milk was boiled as a preservative measure.

Toward the end of the century, housing was better ventilated, on the assumption that bad air was the source of diseases such as diphtheria and malaria. Cleanliness must have reduced insect infestation, but insecticides were not introduced until well into the twentieth century.

4. Until bacteria were identified as causes of infection in the latter part of the nineteenth century, the medical community both in Europe and the United States was not totally convinced of the infectious origin of some diseases. Hence, few measures were used in hospitals and clinics to prevent the transmission of diseases from one patient to another although, ironically, in the general community, quarantine and isolation were sometimes imposed for certain diseases such as plague and leprosy.

5. Control of the working environment lagged behind the technology of industrialization. In 1910, Dr. William

Gilbert of the Belgian Labor Department declared, "It is well known that there is no industrial hygiene in the United States (*ca n'existe pas*)" (Rosen, 1958, p. 419). The U.S. Bureau of Mines was not established until 1910, nor the Division of Industrial Hygiene and Sanitation until 1914.

6. Hospital and medical treatments were limited in scope. Beds and clinics were in short supply; medical and surgical treatments were developing very slowly. The use of anesthesia was limited until 1846. Wound sepsis and cross-infection in hospitals were common. A patient admitted for a hernia may have been discharged with typhoid or dysentery. These conditions prompted Florence Nightingale to produce her *Notes on Hospitals* (1863), with the well-known comment that a first requirement of a hospital was that "it should do the sick no harm."

7. Organized health services were developed later. The Board of Health in New York City was established in 1866 and the Massachusetts State Board of Health in 1869. Other states followed: California in 1870, the District of Columbia in 1871, Minnesota and Virginia in 1872, Michigan in 1873, Maryland in 1874, Alabama in 1875, Wisconsin in 1876, and Illinois in 1877. On the national level, quarantine at ports was assigned to the Marine Hospital Service in 1878; the Eaton bill creating a National Board of Health was adopted in 1879. National voluntary health programs began in the latter part of the century. The American Public Health Association was established in 1872, a National Association for Prevention of Tuberculosis in 1904; the Society for the Control of Cancer was not organized until 1913 and the Heart Association not until 1922.

How, then, did mortality decline? It seems logical not to credit advances in medical and sanitary practices or health delivery services with a major role in the nineteenth-century mortality decline. However, since health and environmental conditions for most Americans were remarkably poor by present-day standards, any small improvement could have shifted the balance in the direction of mortality decline. Furthermore, the collective impact of a number of small improvements could have been reasonably effective. These may have included (1) improvements in personal prevention, (2) recession of certain diseases, and (3) some improvement in medical and preventive practice.

Improvements in personal prevention. Nutritional improvements were considerable in view of an increased availability of a variety of foods to families who could not previously afford them. Personal hygiene, a strong protection against infection, also improved with socioeconomic development. Better housing and living standards were slowly but progressively evolving and were increasingly beneficial in reducing the likelihood of diseases related to poor sanitation and overcrowding. And, as

noted above, there were some improvements in public water supply and sewage disposal.

Ecologic recession of certain diseases. Not all the temporal changes in the occurrence of disease or its severity are completely clear. Two main mechanisms may be involved. One is that certain diseases occur in waves over long periods of time (spanning several generations) during which the disease changes significantly in severity or occurrence or both. A prominent example is scarlet fever, which was usually a fatal disease in the nineteenth century and then became a mild disease in the twentieth. Another mechanism relates to changes occurring in the environment that are unfavorable for the transmission of the disease. A classic example is the disappearance of the black rat from Europe after the black death epidemics, following which the waves of plague became less frequent. This particular example may not be relevant to the United States, but changes in host-agent-environment interaction are suspected to have affected other diseases as well.

Improvement in medical and preventive practice. Although conditions of medical care by today's standards were deplorable until the end of the nineteenth century, some small improvements may have had a bearing on health. These include (1) improved midwifery practice, especially the increased use of forceps and the introduction of antiseptics in the delivery room, (2) sanatorium treatment for tuberculosis, the leading cause of death in the United States throughout the nineteenth century, (3) some isolation practices for fevers in some hospitals, (4) voluntary efforts on a local basis, and (5) improved child care, related partly to rising education levels.

The 1970s. The 1970s witnessed further maturation of the epidemiologic transition in the United States. The long-term shift in patterns of disease continued with further replacement of infectious diseases by degenerative and man-made diseases as leading causes of morbidity and mortality. From 1970 to 1977, life expectancy rose by three years to 73 years, ranging from 65.0 for nonwhite males to 70.2 for white males, from 73.6 for nonwhite females to 77.8 for white females. The mortality gap narrowed between whites and nonwhites but widened between males and females. Infant mortality continued its descent to an all-time low of 14 per 1,000 live births in 1979. The leading causes of death remained in almost the same ranking; the first five were in descending order: heart disease, cancer, stroke, accidents, and influenza-pneumonia. An important exception was that suicide crept into the ninth position.

Fertility continued its descent from the baby-boom level of the 1950s to reach a crude birth rate of 15 per 1,000 in the late 1970s. Population grew to an estimated 220 million in 1979, the result both of natural increase and net in-migration.

The microtransition in certain important diseases, particularly heart disease and cancer, demonstrated significant changes. Mortality from heart disease started to decline especially in the late 1960s, although it continues to be responsible for close to 40 percent of all deaths. Determinants increasing risk include changes in life style as well as the aging of the population. Coronary, or ischemic, heart disease (CHD), the most serious category in this group in terms of premature death and disability, has shown a peculiar pattern. Considering the population at risk, namely those aged 35–74, the epidemic of CHD continued until about the late 1960s when it started to decline. This is a phenomenon occurring for the first time and may be the result of several behavioral and medical factors, such as (1) cessation of smoking, (2) low-fat diet and low levels of cholesterol, especially low-density lipoproteins, (3) decline in hypertension, (4) decline in diabetes, and (5) early diagnosis and intensive care. Other risk factors that may have changed include exercise and ill-defined features of life style.

As to cancer, it is currently responsible for close to 20 percent of all deaths. Thus, two diseases (heart disease and cancer) are currently responsible for more than half of all deaths in the United States. Between 1970 and 1976, the death rate from cancer increased from 162.8 to 175.8 per 100,000 population. In general, the mortality rate was higher among whites than blacks and among males than females. The leading cancer sites in men were lung, prostate, colon, bladder, lymphomas, pancreas, and stomach, although stomach cancer was declining. The leading cancer sites in females were breast, colon, uterus (and cervix), lung, ovary, and lymphatic system. Mortality in females for most sites decreased somewhat, but lung cancer increased because of a wave of smoking, which started among women several decades ago.

Summary. The United States mortality and fertility experience fits the classical or Western model of epidemiological transition theory. During this transition, pandemics of infection were gradually replaced with degenerative and man-made diseases until in 1979 the leading causes of death were heart diseases, cancer, stroke, accidents, and influenza-pneumonia. Cancer mortality rates continued to rise, especially in the male, while heart disease mortality rates started to decline somewhat. Together, heart disease and cancer claimed five or six of every ten deaths in the United States. This epidemiologic transition favored whites over nonwhites, females over males, and the young over the elderly. The gains against mortality in the United States were initially due to social and economic development, joined in the twentieth century by medical progress based on intensive research and discovery. Fertility started at higher levels than in Europe in the eighteenth and nineteenth centuries but then rapidly declined to European levels in the twentieth cen-

tury. The population, though aging progressively, is still growing, as a result both of natural increase and net migration.

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See also MORBIDITY AND LONGEVITY; MORTALITY; PUBLIC HEALTH.

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ESTIMATION

See INDIRECT ESTIMATION OF FERTILITY AND MORTALITY; PROJECTIONS.

ETHICS

Population ethics consists of systematic ethical reflection on population-related behavior, population policies, and population problems. Ethics encompasses three interrelated subdivisions: (1) normative ethics, the analysis of what kinds of actions and policies are right or wrong, what ends are good or evil, and what persons and traits are morally praiseworthy or blameworthy; (2) metaethics, the analysis of the ways in which and the extent to which judgments involving these moral terms are rationally justifiable; and (3) applied ethics, the analysis of specific moral decisions and policies and the application within such analyses of normative and metaethical reasoning. The basic methods of ethics are drawn from philosophy and theology and to some degree from other sciences, particularly the social sciences. Population ethics, a relatively recent instance of applied ethics, already has a growing literature (Dyck, 1977; Green, 1976; Reich, 1978; Veatch, 1977; Wogaman, 1973).

Questions of ethics are present whenever population phenomena are regarded as problems and whenever population-influencing or population-responsive policies are debated or set in motion. When populations grow or diminish, either situation can be seen as creating problems. These problems may be perceived as serious enough to warrant recommending and instituting corrective policies. To advocate a policy is to specify a responsible agency, a goal, and appropriate means for its realization. Each element of a policy recommendation may be questioned as to its rightness or wrongness, and the whole policy may be examined as to whether its successful implementation would make life better or worse for the people affected.

Substantive moral issues have long been associated with the behavior and choices that determine births, deaths, and migration, the three variables most immediately responsible for the size and composition of populations. All the major religious traditions have sought to provide moral guidance in these areas of human decision making. The views taken by governments, intellectuals, and others as to the nature of population problems and policies, and the means inherent in these policies, are matters of moral concern for religious ethical traditions and those loyal to them, for scholars who work in the field of ethics, and for conscientious citizens.

Major positions taken in identifying population prob-

lems and advocating policies are here examined to see what moral assumptions and assertions they involve. Discussion of these positions will be focused around certain primary moral values, which are acknowledged both within and outside the field of ethics by a wide variety of writers and by those actively involved in matters of population. Various authors conceptualize and reason about these values in very different ways. Differences in points of view regarding population matters and policies result not only from differences in moral values and moral reasoning, but also from differences in the knowledge and understanding of facts, assumptions about human nature and destiny, and various individual and group loyalties (Dyck, 1977). A complete assessment of population problems and policies would therefore analyze these variables in addition to the variable of moral reasoning.

In population policy debates, three moral values recur, one or the other of which becomes the cornerstone of positions that are proposed or acted upon. These three are survival, freedom, and justice, justice as concerned with both welfare and impartiality.

Survival. Some argue that the present rate of population growth in the world is an immediate threat to human life and to the survival of the human species. They posit a crisis. For them, and for some others, zero population growth has become an explicit political aim targeted for both the affluent and nonaffluent nations of the world. To see population growth in itself as a threat to human life is to appeal to a very profound and deeply held human value. Stress on the finitude of the earth and its resources makes it seem self-evident from a moral point of view that population policies to end population growth are necessary. With human life itself threatened, the argument goes that it seems unnecessary to say very much about justice, freedom, and other values of human welfare, because the highest priority surely is to survive. The emphasis on survival as the problem, therefore, is at the heart of the moral justifications that crisis-oriented advocates offer for population policies, sometimes even for coercive policies. Such policies may include economic incentives, both positive and negative, compulsory abortion in certain cases, triage in matters of food policy, and, speculatively, antifertility chemicals in water supplies (Berelson, 1969). The senses in which policies may be seen as coercive are discussed below.

On the face of it, a concern for survival is a generally shared and weighty moral consideration. A critical question may be raised, however, as to whose survival is at stake. The foci of population analyses differ enormously on this point—sometimes the whole human race, sometimes existing nations, sometimes ethnic groups. Always underlying discussions of survival, often as an unexamined premise, is a treasured way of life. Such loyalties to a way of life may be quite ethnocentric and will, in any event, vary tremendously across cultures. The idea expressed by some crisis-oriented advocates that certain nations are hopelessly overpopulated and therefore should be excluded from food aid understandably provokes rancor from those who see such a policy as an attack on a whole civilization or way of life. Cultural and personal loyalties left unanalyzed function as biases and tend to subvert the rationality of moral reasoning and of policies in which such reasoning occurs.

Even where it is agreed that some specified group faces extinction or enormous losses of life from continued population growth or diminution, this fact by itself does not provide an adequate ethical argument for the strict regulation of procreative behavior. Presumably one might expect members of such a threatened group voluntarily to act in ways that recognize the tie between their own individual and collective interests. Those who argue for government regulation of fertility behavior as a necessity posit an irreconcilable conflict between individual and societal interests. Such an assumption has been questioned by others and is being tested, for example by instituting family planning programs in which persons may participate voluntarily. Throughout the world, population policies are for the most part equated with such voluntary governmental family planning programs.

From a moral point of view, one reason for this voluntary approach is that freedom in procreative matters is so highly valued. In a direct conflict with survival, some would value freedom even more highly. Freedom to make procreative decisions at the individual or familial level has been endorsed by all major world religions and by many governments. Indeed, a resolution introduced at the United Nations in 1966, asserting the right of couples to choose the number and spacing of their children, was signed within one year by thirty heads of state. Recognizing such a right entails an obligation of governments to facilitate and protect individual or familial privacy in making decisions about procreation ("Declaration on Population," 1968).

Freedom. Freedom is understood in at least two different ways. It can mean liberty, that is, absence of constraint. It can also refer to an ability or opportunity to make choices. Voluntary family planning programs receive endorsement based on both of these perspectives.

The stress upon liberty (absence of constraint) has been well represented and summarized within the report of the U.S. Commission on Population Growth and the American Future. In the words of the Population Commission Report (1972, pp. 72–73): "Population growth forces upon us slow but irreversible changes in life style. Imbedded in our traditions as to what constitutes the American way of life is freedom from public regula-

tion—virtually free use of water; access to uncongested, unregulated roadways; freedom to do as we please with what we own; freedom from permits, licenses, fees, red tape, and bureaucrats; and freedom to fish, swim, and camp where and when we will." From this perspective, any government regulation or manipulation of family planning behavior is seen as coercive and morally undesirable.

But a concern for absence of government constraint is an argument for voluntarism, not an argument for government assistance for any particular procreative choices. For family planning advocates, procreative freedom is not realized simply by the absence of interference from governments or others, but by the ability to make choices with respect to the number and spacing of births. They have contended, therefore, that governments should be involved in the provision of family planning information and services, because large segments of the population are poor and need help with the acquisition of modern contraceptives, and because many lack information regarding the existence and usefulness of birth control methods. Policies of the Office of Population of the U.S. Agency for International Development illustrate this point of view. Advocates cite the large body of international survey data to the effect that people approve of using birth control methods and tend to have more children than ideally they prefer. These advocates often presume that small families help parents to give more attention to their children and to use what resources they have to educate them and to provide for their future well-being. Further advantages of contraceptive use are a reduction in the risks of pregnancy, in the risks associated with many successive or poorly spaced births, and in the unhappiness surrounding unwanted pregnancies. Thus, from the standpoint of those who advocate family planning as a population policy, governments are being asked to provide what is at once a necessary human service and a means to the reduction of birth rates.

Among supporters of family planning, various views exist as to the circumstances under which population growth is seen as a social ill. Their general adherence to voluntarism may crack in the face of serious social problems that persist despite the best efforts of the usual programs. Thus, although they see coercion as a curtailment of liberty, they also value life and survival and so as a last resort might turn toward more coercive policies where voluntarism proves unsuccessful. In keeping with a strong emphasis on the value of liberty, it is usually contended that governments should move from the least coercive to the most coercive methods required to meet societal needs. The use of monetary incentives is usually cited as a possible intermediate step before turning to radically coercive methods such as compulsory steriliza-

tion or a rationing scheme backed by punitive measures for noncompliance (Berelson, 1969).

Freedom as absence of constraint and freedom as an ability to make choices can come into conflict. If voluntary birth control programs fail to prevent certain harms—for example, high death rates, extreme poverty, or vital resource depletion—manipulation or regulation of procreative behavior can be viewed as justified much more readily by those who see the ability and the will to curtail births as an opportunity and a source of freedom.

Direct efforts of the government to influence or control procreative choices can be seen as analogous to the provision of compulsory education for the sake of assuring certain opportunities. Some family planning advocates have so highly stressed the freedom associated with the use of modern contraceptives that they have denied the coerciveness of certain incentive programs. Accordingly, they have viewed monetary rewards, whether for accepting modern contraceptives or for achieving a certain family size, as opportunities that potential recipients may choose to accept or reject.

Others have reasoned that incentives are coercive because the very poor may be lured into curtailing births in circumstances where such behavior is not reasonably advantageous to them. In instances involving sterilization, this irreversible act may even lead to tragic circumstances, especially where infant death rates are high. Also, some have contended, government inducements to lower birth rates among the poor or particular ethnic groups that have high death rates, can be seen as having "genocidal" overtones. Concern over genocide gains in plausibility where government efforts to encourage small families are isolated from efforts to improve the socioeconomic conditions and health of a targeted, poor population; or when efforts at improving health and socioeconomic conditions of the poor are insufficient or nonexistent.

Voluntary family planning programs provide services that may be chosen or spurned by those for whom they are intended. Persons who do not avail themselves of these services are not penalized by the government or agency offering those services. A family planning program may, however, introduce indirect forms of coercion by influencing people to do what they prefer not to do or by deceiving them with respect to the desirability of a service. One of the ways in which this may happen is by giving monetary incentives to those who distribute a specified quota of modern contraceptives. This practice may lead some persons who hand out or prescribe contraceptives to represent falsely their side effects or to cajole people into acceptance. If a government were sincerely committed to procreative freedom and voluntary acceptance of aids to procreative choices, any monetary

incentives to family planning workers would be for thorough and accurate communication of the potential harms and benefits of accepting birth control services relative to the circumstances of the potential recipient. Violations of freedom can also occur in population education programs that are biased, misleading, or otherwise insensitive to the beliefs, welfare, and freedom of those who are supposed to benefit from such programs.

Sometimes birth control services are not seen as opportunities for increasing procreative choices because the particular methods offered are morally unacceptable. Although all major religious traditions favor the idea of responsible parenthood and may even favor government assistance of family planning efforts, they do not favor every possible method of preventing births. Sterilization and abortion may be sanctioned as therapies under some circumstances but may not be generally approved for the sole purpose of birth control. Furthermore, compulsory birth control programs are perceived by many religious and cultural traditions as an incursion into a sacred domain of the family. Hence a very important ethical consideration for governments is that of the degree and kind of tolerance for religious and cultural differences required to design policies to realize the common good. One argument for a high degree of tolerance is that procreative freedom is a good (or right) to be protected by governments. The strong reaction to compulsory sterilization in India may be some evidence that familial procreative choices are widely seen as rights. The United Nations has taken that view.

The freedom of each national government to decide whether a population policy is needed and, if needed, what form it should take, is another aspect of tolerance for differences in outlook and situation. Some crisis-oriented authors have suggested strongly coercive methods for influencing nations considered to be overpopulated and, in this respect, a drain on vital world resources. Withholding food aid has been one such suggestion. Generally, however, worldwide governmental forums, such as the United Nations and the World Population Conference (1974) held in Bucharest, have strongly endorsed the idea of national sovereignty in population matters. On this view, certain kinds of population assistance among nations have sometimes been seen as coercive.

Some who favor procreative freedom do not accept the position that family planning programs by themselves significantly increase procreative options. Whereas families that have enough income tend to invest in each child and derive satisfaction from limiting births accordingly, countless poor families in the world are not able to do so. In areas with very high infant mortality rates, there may be express desires for smaller families, but people may continue to have many births. Under circumstances such

as those in the Punjab studied by John B. Wyon and John E. Gordon (1971), where half of the peasant families had three or more of their children die, either in infancy or later, few would risk a two-child or three-child family. The safe course if one is to have children as security in old age, for labor in the fields, and for the joys and satisfaction of children in posterity, is to give birth roughly every two or three years as people in such situations do, and to stop, on the average, once there are four or five living children. The necessity and desirability of sons for religious and inheritance purposes also contribute to what amounts to having more children than one professes ideally to desire.

It has been noted that data cited as proving the success of governmental family planning programs often reveal that declining birth rates tend to occur in countries and regions where income and the freedom to make choices are increasing for those at the lower-income levels. This observation has led some to focus directly on the achievement of improvements in distributive justice as not only morally desirable in itself, but as a significant factor in understanding population problems and policies to deal with them.

Justice and Welfare. A new world orientation toward population problems and policies is taking shape. This "developmental distributivist" orientation (Dyck, 1977) claims that population problems and policies should have as their concern the equitable distribution of social and economic welfare, with particular stress on enlarged benefits to the poorest strata of society. The key to lowering fertility is seen as an improvement in distributive justice, which by spreading income and social services will result in increased literacy, decreased infant mortality, better health generally, and security for the aged. After analyzing considerable data, William Rich (1973, p. 37) concluded that

development policies that focus on participation and increased access to benefits for the population as a whole do seem to produce a major impact on family size. In countries which have a relatively equitable distribution of health and education services, and which provide land, credit, and other income opportunities, the cumulative effect of such policies seems to be that the poorest half of the population is vastly better off than it is in countries with equal or higher levels of per capita GNP but poor distribution patterns. The combined effect of such policies has made it possible for some countries to reduce birth rates despite their relatively low levels of national production.

In 1974 at the World Population Conference held in Bucharest, the majority of governmental representatives saw the achievement of distributive justice as a requisite to reducing and halting population growth throughout the world. Marxists and Roman Catholics, among oth-

ers, shared this orientation. Indeed, major world religions tend to share this kind of concern.

Demographers have theorized that the transitions to low birth rates in Western countries are associated with low infant mortality rates, high literacy rates, and processes of modernization that included such developments as higher income and better income distribution, improved agriculture, and the provision of social security. In further support of developmentalist views, analysts point to a growing number of countries that are entering a demographic transition at a somewhat faster rate than was true of Western countries (Kirk, 1971).

Those who have been part of the large consensus that family planning programs are the most moral and demographically efficacious way to lower fertility rates have also, for the most part, recognized the association between social and economic development and lower fertility. But what type of development is defended and what relation that development has to the priorities shaped by population policies depend, in large part, on the view of justice held.

Family planning advocates have tended implicitly to accept a utilitarian conception of justice. In its simplest and most influential form, utilitarianism takes the view that justice is realized to the extent that a given action or policy brings about the greatest good for the greatest number. Economists and optimum-population theorists using this formula often assume that the welfare of a whole people or nation can be measured by per capita income. In this view, increases in per capita income reflect increases in the greatest good for the greatest number. A further assumption has been made by some that benefits distributed to wealthier investors in a society can serve the cause of justice, because the economic benefits of investments by these wealthier individuals will, in time, trickle down to the less wealthy. Thus the greatest good for the greatest number, conceived as an average, can be improved even where disparities of wealth are increased, provided that some segment of the population experiences a sharp increase in wealth. This theory weighs future consequences in determining the rightness of a policy and asserts that future long-run consequences are as important as immediate consequences. Thus, even if a policy would seem to be of no benefit to the poor in the short run, it may be justified by eventually benefiting some or all of the poor in the long run. Such a view raises a serious ethical question concerning the interests of this generation versus those of the following ones.

The distributivists have tended to share a conception of justice that makes it imperative to institute policies that are immediately and directly beneficial to those who share least in the goods and opportunities of their societies. "To each according to his needs" has guided Marx-

ist and socialist thought in this direction. This formulation has roots in Scriptural traditions shared by Jews and Christians and has its counterparts in other religious traditions as well. Recently the philosopher John Rawls (1971) has explicitly refined principles of justice rooted in natural law and contractarian traditions that constitute a longstanding alternative to utilitarian conceptions of justice. Liberty is to be maximized to the extent compatible with like liberty for all; differences are arbitrary unless they are mutually advantageous, and especially advantageous for the least advantaged, and unless social positions are open to all. The policies implied by the Rawlsian formulation of a just society share in the core affirmation that unites an otherwise diverse group of developmental distributivists, namely, that each member and segment of any population unit should have enough access to the social and economic opportunities in their society to make it reasonable to expect them voluntarily to plan their families and their future. Only if this goal is attained can one justly implement policies that limit procreative choices, and then only if such policies are otherwise morally justifiable (Green, 1976).

A conception of justice pledged to population policies that respond directly to the most basic needs of the disadvantaged has clear implications for policies relating to migration. Consider, for example, migrants pressing into cities from rural areas or into the more affluent nations. Where poverty is a cause of this shift and where the cities or nations in question do not adequately accommodate these migrants, justice requires programs of development that provide the rural or urban opportunities that would prevent or accommodate this migration.

Among the crisis-oriented who assume that zero population growth is desirable in affluent as well as nonaffluent societies, immigrants are perceived as unfairly denying couples of the host population their "quota" of births. "Family planners," to the extent that they see the reduction of population growth as the way to retain or increase per capita welfare, may not object so much to the influx of migrants as to their large family size. Both family planning advocates and the crisis-oriented may see high migrant fertility as a sign of irresponsibility or ignorance. Educational and birth control services may be endorsed as a high priority, requiring the investment of time and money without delay. Some would seek to reduce migration by quota systems and strict enforcement.

Justice and Impartiality. How does one decide among competing policy recommendations and competing values and conceptions of these values? Furthermore, who makes these choices and who implements the policies that are chosen? These are metaethical questions.

Justice refers to a fair allocation of goods and resources and of rewards and punishments. The notion of fairness

here may refer to what and how much in goods and resources is due to various members of a group or the group as a whole. But fairness also refers to impartiality. A morally just or fair decision is one that is impartial. Ethicists have come to agree by and large that a moral judgment is reasonable if it meets three criteria: knowledge of nonethical facts; vividly imagining how people are affected by the action, policy, or state of affairs being judged; and impartiality.

However, achieving reasonableness or fairness in decision making is complicated by the fact that there are alternative ways to conceptualize the notion of impartiality, especially as it involves public policy decisions. The great bulk of thinking behind the advocacy and implementation of family planning programs has presumed that national governments choose from among the population policy recommendations, and the values and interests they represent. But questions may be raised about the representativeness and legitimacy of various governments. Some of these questions have been raised in the name of justice from a variety of perspectives, although not often by family planning advocates. For example, contemporary Marxist societies presuppose that the impartiality they associate with a single party committed to a planned economy assures procreative freedom. However, severe criticisms of the unfairness in policy making and policy implementing in one-party systems as evident in contemporary Marxist societies have been raised by those with a democratic perspective based on elected representative governments and multiple-party systems.

One interesting, growing trend among those who are concerned with fairness and morally acceptable population planning and development is an increasing emphasis on the necessity of local participation. Heightening the involvement of people in their own communities and augmenting their ability to control their own affairs are increasingly seen as forms of social and economic development in themselves. To achieve the fairest representation of diverse interests and values, it is argued that planning "from the top down" should be replaced by planning "from the bottom up." At the World Population Conference (1974), this kind of thinking was present in the argument for more participation of women in the structures of society. It was thought that such increased participation would more fully actualize the interests and perspectives of women concerning procreative choices and population policies generally.

Arthur J. Dyck

See also BIRTH CONTROL MOVEMENT; FAMILY PLANNING PROGRAMS, *articles on* DEVELOPING COUNTRIES, NONCLINICAL PROGRAMS, *and* UNITED STATES; LAW AND FERTILITY REGULATION; POPULATION POLICY; RESOURCES AND POPULATION.

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EUGENICS

See BIRTH CONTROL MOVEMENT; GENETICS.

EUROPE

Europe is defined by its Atlantic and Mediterranean coastlines and islands to the north, west, and south and by the western frontiers of the Soviet Union and Turkey to the east. In 1978 about 480 million people lived in the

EUROPE

ICELAND

GERMAN DEM. REP.
(EAST GERMANY)

FED. REP. OF GERMANY
(WEST GERMANY)

Faeroe Is.

UNITED KINGDOM

SCOTLAND

IRELAND

WALES

ENGLAND

NORWAY

SWEDEN

FINLAND

BALTIC SEA

(SOVIET ASIA)

UNION OF SOVIET SOCIALIST REPUBLICS

(SOVIET EUROPE)

ATLANTIC

OCEAN

NORTH
SEA

DENMARK

NETHERLANDS

BELGIUM

LUXEMBOURG

FRANCE

SWITZERLAND

AUSTRIA

POLAND

CZECHOSLOVAKIA

HUNGARY

ROMANIA

YUGOSLAVIA

BULGARIA

BLACK SEA

PORTUGAL

SPAIN

ITALY

ALBANIA

GREECE

Gibraltar

MEDITERRANEAN SEA

MALTA

thirty-two autonomous political units making up the continent. Five countries accounted for half the total population—West Germany (61.3 million), Italy (56.8 million), the United Kingdom (55.8 million), France (53.4 million), and Spain (36.7 million). Nineteen countries had populations of less than 10 million, including the five miniature states of Andorra, Liechtenstein, Monaco, San Marino, and Vatican City, which together had a total population of less than 0.1 million.

A principal feature of European population is an increasing homogeneity of demographic character; all countries share relatively low fertility levels within a moderate range, and low mortality. The present general trend is toward an end of growth in almost all countries, Ireland and Albania being notable exceptions but outweighed in their effect by present net declines in West Germany (the Federal Republic of Germany) and East Germany (the German Democratic Republic). Homogeneity must, however, be considered in the context of two major aspects of social change, that of the demographic transition and that of marked regional differences in the history of economic and social modernization.

Europe can be considered as three major regions: northern and western, southern, and eastern. Table 1 sets out the division by countries following United Nations conventions; this article groups northern and western Europe together as demographically very similar.

Demographic Transition and Regional Differences. Northern and western Europe led the world in the Industrial Revolution and set a world pattern of social modernization, urbanization, and industrialism, together embracing a whole complex of fundamental changes in society related to rising standards of material well-being. On the one hand expanding science and technology found wide acceptance through education and mass literacy. On the other hand political democracy and secularization broke down traditional social systems and replaced them by institutional structures balancing tensions between the idea of individual rights and collectivist social theories. It is widely accepted that the great shift in demographic behavior that we call the "demographic transition" is only to be understood against the background of these economic and social changes first recorded in Europe. But Europe has not been all of a single

TABLE 1. *Total populations of countries of Europe, by region, 1950–1979 (in millions)*

Region/Country	1950	1970	1979
Northern Europe			
Denmark	4.27	4.91	5.11
Finland	4.01	4.61	4.76
Iceland	0.14	0.20	0.22
Ireland	2.97	2.94	3.37
Norway	3.27	3.87	4.07
Sweden	7.01	8.04	8.28
United Kingdom	50.29	55.42	55.84
Western Europe			
Austria	6.94	7.43	7.50
Belgium	8.64	9.66	9.84
France	41.83	50.78	53.37
Luxembourg	0.29	0.34	0.36
Netherlands	10.11	13.03	13.99
Switzerland	4.69	6.27	6.30
West Germany	49.99	60.71	61.32
Eastern Europe			
Bulgaria	7.25	8.49	8.80
Czechoslovakia	12.39	14.32	15.18
East Germany	18.39	17.07	16.75
Hungary	9.34	10.34	10.70
Poland	24.82	32.53	35.05
Romania	16.31	20.25	21.95
Southern Europe			
Albania	1.21	2.14	2.63
Greece	7.57	8.79	9.40
Italy	47.10	53.66	56.83
Malta	0.31	0.32	0.33
Portugal	8.40	8.72	9.82
Spain	28.01	33.78	36.67
Yugoslavia	16.35	20.37	21.11

Sources of data: Unless otherwise noted, data in this and subsequent tables have been drawn from United Nations *Demographic Yearbooks* and national publications.

piece in this sense, and although one may speculate about the rate of demographic convergence in Europe today, the regional differences are still significant. In the broadest terms the countries of northern and western Europe experienced early industrial and urban growth and today are among the most mature, economically advanced nations of the world with 75–85 percent of their populations in urban areas. The countries of southern Europe retained a more agrarian economy and society with a strong peasant culture until the 1930s, and although they are now moving quickly towards an urban industrial structure comparable with that of the north and west, they still are recognizably different in socioeconomic character. They have shown rapid declines in fertility and to a lesser degree in mortality, which, during the last fifty years, have brought them into closer demographic similarity with northern and western Europe.

The countries of eastern Europe form a distinct region in a rather different sense. Again these were predominantly peasant agrarian societies before 1939, but from 1945 their pattern of socioeconomic change has been in the context of a rigorous orthodoxy of socialism drawing its model from Soviet communism. Such dramatic political changes have been founded on a notion of economic development based on a deliberate restructuring of society and on planned allocation and use of resources, and also on the close gearing of social behavior to a formal ideology. Important questions need to be asked about the effect of these changes on demographic trends and how such trends in eastern Europe compare with those apparent in southern Europe, and indeed with current and past trends in northern and western Europe.

The regional concept is one of two major aspects of European demographic change; the other is that of the demographic transition, the fundamental historical movement from low rates of increase in preindustrial societies because of high wastage of life (including very high infant mortality), to low increase rates in advanced societies because of low fertility and very low mortality. Central to the changes in fertility behavior are the norms of the small family and higher status for women, giving them full choice with men about fertility behavior. The European experience from the early nineteenth century to the present day provided the data on which the general transition model is based, which is not to say that every European country fits exactly with the model; certainly it must be noted that part of the notion of Europe in three regions characterized by different social histories is that movement through the process has been at different rates and over different decades in particular countries. There are some important historical anomalies; for example, France recorded a strikingly low level of fertility for much of the nineteenth century, and the view has been powerfully advanced that the decline in European fertility from the mid-nineteenth century onwards resulted more from strong motivation plus poor methods of restricting fertility than from efficient birth control, which was not readily available in most European countries until well into the twentieth century (Glass, 1976).

The experience of northern and western Europe since about 1960 has suggested that a further phase should be added to the transition model, that of extremely low rates of increase based on stable, low to moderate mortality levels (reflecting higher average age of populations because of decades of low fertility) and increasingly stable, very low fertility levels (crude birth rates below 15 per 1,000). The striking convergence of crude death and birth rates (at about 10–12) in northern and western Europe since 1970 has given a tone of reality to demographic theories of zero growth and stable population. If

the original hypothesis is historically true, that changes in population trends follow imprecise but significant relationships with economic and social trends, relationships that may only vary in degree with political objectives and ideologies, then recent and current European demographic trends may be of some interest to other parts of the world in the not too distant future.

Table 2 provides basic data for the nine largest national populations in Europe; they include countries from all three major regions. Demographic homogeneity is reflected partly in a pattern of generally moderate and declining birth rates. In 1950, sixteen European countries had crude birth rates of over 20 and only Luxembourg had a rate under 15. In 1978, only Ireland had a birth rate above 20, and fourteen countries recorded rates below 15, including most of the larger populations.

Mortality. The death rates in Table 2 show the relatively low levels and stability of mortality indexes in most countries. There are two "normal" levels of death rate in Europe: about 10–12, which derives from an older age structure, itself consequent upon relatively lower fertility in preceding decades; and about 8–10, which reflects a younger age structure, usually resulting from higher fertility persisting into the postwar years. Although Yugoslavia is defined as "southern" in United Nations statistics, it is of course a socialist republic with much in

common in recent history with other eastern European countries, and certainly its recent demographic trends are closely comparable with those of Poland and Romania. East Germany records indexes similar to those of West Germany and indeed is as exceptional in its way in eastern Europe as Ireland is in the west.

As the common endemic and epidemic diseases and the risk of starvation have ceased to be the chief limitations on life expectancy, the determining factor in mortality has become the combination of age with a very few clinical conditions that so far resist advances in medicine. Indeed, the crude death rate is increasingly an index to the broad age structure. All European populations have reached relatively stable, low mortality levels within the last thirty years, levels that were already characteristic of northern and western Europe half a century ago. No significant changes are to be expected in the next thirty years unless the difficult problems of the residual killing diseases (e.g., cancer) are solved.

Two aspects of mortality trends merit a separate comment: the trend in infant mortality and the trend in female-male life expectancy. Infant mortality (the death rate of infants under 1 year old per 1,000 live births in any one year) has long been regarded as a most sensitive index of social development. Over the whole of Europe these rates have declined remarkably since the beginning of the twentieth century, in some countries to very low levels indeed. In most countries they are still declining, and the balance of demographic homogeneity with regional variety is clearly shown in Table 3, where the downward trend is consistent overall. The figures are converging, at a generally low level, from the marked differences that survived in the early postwar years.

The selected figures in Table 3 may be taken as typical

TABLE 2. *Crude birth and death rates, selected countries, 1950–1979*

Region/Country		1950	1960	1970	1979
Eastern Europe					
East Germany	CBR	16.9	17.2	13.9	14.0
	CDR	11.8	13.3	14.1	13.9
Poland	CBR	30.7	22.6	16.6	19.5
	CDR	11.6	7.6	8.2	9.2
Romania	CBR	26.2	19.1	21.1	19.1
	CDR	12.4	8.7	9.5	9.7
Northwestern Europe					
France	CBR	20.9	17.9	16.7	14.1
	CDR	12.8	11.3	10.6	10.2
United Kingdom	CBR	16.3	17.5	16.3	13.1
	CDR	11.8	11.5	11.8	12.1
West Germany	CBR	16.5	17.8	13.4	9.5
	CDR	10.5	11.4	11.7	11.6
Southern Europe					
Italy	CBR	19.5	18.3	16.8	11.8
	CDR	9.8	9.7	9.7	9.4
Spain	CBR	20.2	21.8	19.5	17.3
	CDR	10.9	8.8	8.5	8.0
Yugoslavia	CBR	30.2	23.5	17.8	17.1
	CDR	13.0	9.9	9.0	8.5

TABLE 3. *Infant mortality, selected countries, 1950–1979*

Region/Country	1950	1960	1970	1978–79
Eastern Europe				
Czechoslovakia	75.3	24.0	22.5	17.6
East Germany	70.3	37.8	19.7	13.1
Poland	110.0	60.9	32.4	21.1
Romania	118.1	74.8	48.9	30.3
Northwestern Europe				
France	54.3	27.5	19.6	10.1
Sweden	22.0	16.3	11.7	7.8
United Kingdom	32.2	22.6	18.3	12.7
West Germany	55.8	33.3	23.4	13.5
Southern Europe				
Greece	43.6	40.2	29.5	19.5
Italy	68.1	43.3	29.4	15.3
Spain	70.9	46.1	30.0	13.2
Yugoslavia	121.1	87.2	57.0	33.6

in their range and trend. The rates of the late 1970s are between a half and a quarter of those current in 1950. Rapid decline in the rates from over 100 is largely the result of improvement in the social environment, but the continuing decline in lower rates is probably because of increasing professional supervision of pregnancy and birth, and rising proportions of hospital deliveries. It is presumed that rates at present over 15 will tend to fall still further.

The second interesting feature of modern mortality is the increasingly greater life expectancy for females against that for males. Most countries in Europe show a life expectancy from birth for women ranging from about 73 years (e.g., Hungary and Poland) to about 77 (France and the Netherlands), compared with 66 years to 70 years for males. These figures are for 1975 and are about 10 percent higher than those for 1950. Within the last decade, the increase for female expectancy is significantly higher than for male, and there is evidence of a slight increase in male mortality in some countries among younger adults as a result of road and industrial accidents, and also in the 65–75 age groups. Female age-specific death rates are lower than male throughout, and female life expectancy is increasing for all European countries. This situation has important social consequences; a large number of elderly women face problems of living alone or in some form of dependency situation following widowhood. Table 4 shows the sex imbalance in European populations at ages above 75.

Marriage, Cohabitation, and Divorce. The chief importance of nuptiality to the demographer is that the vast majority of births occur in the context of marriage (over 90 percent in all European countries except Sweden and Denmark). About 80–90 percent of men and women marry, almost all of them before the age of 40. The age of women at marriage has long been regarded as a key factor in fertility because it determines the length of exposure to the risk of pregnancy. This factor is now less important than modern reliable contraception and the widespread norm of the two-child and three-child family. In fact, the average age at marriage has fallen fairly

steadily since early in the twentieth century, when fertility was declining; marriage frequency was very high in the 1960s and 1970s when fertility fluctuated, and fell to very low levels in the mid-1970s. Although marriage incidence generally increased in the 1960s there is now some evidence that marriage rates are falling, chiefly because of some reduction in the number of marriages at very young ages.

Once again the general homogeneity of European demography is in evidence, but the regional differences are there even if not strongly marked. They are more notable in regard to men than to women. A second general point is the increased numbers of marriages at the later date.

In modern industrial societies, women tend to marry men about three years older than themselves; this practice of course raises the probability of a wife surviving her husband. Among young adults the age differential is most marked at the under-20 level. Around 1975 the proportion of brides who were under 20 ranged from 15 to 25 percent in European countries, while the proportion of grooms under 20 was much less, from 2.5 to 7.5 percent. The higher proportions of young spouses were in eastern Europe (particularly if Yugoslavia is included in this group), but the variation does not fall easily into a regional pattern. What is important is that the proportions of very youthful brides and grooms increased continuously from the 1950s to the early 1970s and has then decreased slightly in some countries. One factor in this latter trend is the increasing number of second marriages following rising divorce rates, which naturally tend to raise slightly the average age at marriage. The overall pattern reflects the combination of an increasingly widespread view of marriage as a private and personal concern, with increasing confidence in contraception so that the emotional satisfaction of marriage can be freed from the responsibility of early family building except at the choice of the couple concerned. It is not easy to foresee changes in this situation, and it is not likely that any changes to come will substantially affect European demographic trends.

Two national anomalies must be noted in any discussion of European marriage; Ireland and Sweden. Ireland is demographically remarkable, with the highest fertility rate in western Europe, the lowest marriage rate, the lowest rate of use of contraception, and the lowest illegitimacy rate. In Ireland in 1975, 30 percent of the men and more than 20 percent of the women were unmarried at 50 years of age, a pattern that has continued over the last forty years. Key factors are the large number of members of religious communities and a long tradition of late marriage in the countryside, in contrast to the tradition of early marriage in peasant communities of eastern Eu-

TABLE 4. *Population aged 75 and above, selected countries, by sex, 1975–1977 (in thousands)*

Country	Male	Female	Ratio[1]
France	999.3	2,007.5	200.8
Italy	931.0	1,592.4	171.0
Poland	292.7	596.5	203.7
Romania	245.1	379.8	155.0
Spain	512.9	869.4	169.5
United Kingdom	877.0	1,864.1	212.6
West Germany	1,070.7	2,207.5	206.1

[1]Ratio = females to 100 males (over age 75).

rope. Sweden has recorded a marked decline in marriage in recent years, from a peak of 60,000 in 1965 to 44,000 in 1975, and further declining to 37,000 in 1979. The cause of this decline is the increasing numbers of young men and women who choose to cohabit, sometimes quite permanently, without marriage; many of these couples have children and may actually marry at quite a late stage of bringing them up. This trend has been described as another example of Sweden being very much an avant-garde society in social contexts, and the importance of this trend as a pattern likely to be more widely adopted in Europe generally, particularly in West Germany and in the United Kingdom, has been much discussed. So far this development is not clearly recognizable.

An important feature of European nuptiality is the increase in divorce since World War II and particularly since 1960. The new republics of eastern Europe made divorce readily available from the 1950s as part of a declared policy to raise the status of women and to free family relationships from the traditional authority of religious orthodoxies. Divorce in northern and western Europe was suddenly more frequent in the immediate postwar years as a consequence of the profound disturbance of family life and the changes in social norms during and following the war. Divorce has been much later developing in southern Europe; Italy recognized divorce only in 1971 and it has been rare until very recently in Spain and Portugal. Thus, once again, one can see quite significant regional variations in the general European situation.

It is now thought that in the United Kingdom about 20 to 25 percent of present marriages will terminate in divorce, and West Germany is very similar in this respect. Divorce has become much easier in several countries, and it is not clear whether the present trend of increase will continue with some convergence effect, in that countries with a low rate will show a more rapid increase to catch up with those with higher rates. It is possible that different countries will find a "platform" at different levels and may achieve relative stability in the not too distant future.

Certainly the present trend in most countries is for the higher divorce rates to continue (Table 5). The chief demographic significance of high divorce rates is that early marriage tends to be at a high risk of divorce, and consequently a marriage may terminate before family completion. This is probably counterbalanced by the high rate of remarriage among divorcees, perhaps 50–65 percent, and it is likely that most early divorces occur so that at least one partner may remarry very quickly.

Fertility. Fertility behavior in any population is subject to three sets of controls: the number of women in the reproductive age groups and "at risk" (married or otherwise sexually active), the availability of effective techniques of fertility control (abortion, contraception, and sterilization), and finally, individual motivations to control fertility in the context of current social norms. European fertility behavior since 1950 is best explained in relation to two major components of change: the long historic decline of fertility since the late nineteenth century and more recent short-term fluctuations in fertility, which are most conspicuous in northwestern and in eastern Europe although differently timed. Southern European populations are clearly in the final stages of the long-term decline, with no significant change of trend in the last forty years.

Fertility levels in northwestern Europe are generally low by world standards; they are somewhat higher in eastern Europe after increases in recent years. In northwestern Europe, with the longest history of population developments associated with industry and urbanism, there are two distinct trends in the last twenty years; for most countries fertility reached a peak in the mid-1960s following a trough in the 1950s. In France and the Netherlands however, the steady decline of the birth rate from the immediate postwar peaks in 1946–1948 continued with less marked fluctuations, in France from 20.3 to 16.7 in 1970, and in the Netherlands from 26.0 to 18.3 in 1970. It should be noted that northwestern Europe had already reached much lower levels in the mid-1930s, for example, the United Kingdom at 15.0, France at 16.5, and Sweden at 14.1.

In southern Europe fertility has declined from generally high rates, around 25 in 1935, to levels in 1977 that

TABLE 5. *Marriages and divorces, selected countries, 1965–1978 (in thousands)*

Country	1965	1970	1975	1977–78
France				
Marriages	346.3	393.7	387.4	355.0
Divorces	34.9	40.0	62.0	81.4
Italy				
Marriages	399.0	395.5	374.4	325.6
Divorces	(illegal)		10.6	10.5
Poland				
Marriages	199.9	280.3	330.8	326.3
Divorces	23.6	34.6	41.2	43.2
Romania				
Marriages	164.2	145.5	188.1	195.9
Divorces	36.9	7.9	34.5	35.9
United Kingdom				
Marriages	422.0	470.9	428.7	416.0
Divorces	39.8	62.3	129.3	152.7
West Germany				
Marriages	492.1	444.5	386.4	328.2
Divorces	58.7	76.5	106.8	32.5

roughly conform with those of northwestern Europe (Italy at a crude birth rate of 13.2, Greece at 15.8, and Spain at 18.0). The long decline of fertility in Europe since about 1900 is taken to be a classic proof of one of demography's most important general theses: that economic modernization, urbanization, improved education and social provision, and some measure of secularization are together the causal context of declining fertility. This thesis has been repeatedly tested in research in many other parts of the world in recent decades. The tempo and timing of this basic change varied between countries, but the total European trend is unmistakable and unambiguous.

No such general explanation is admitted for the temporary return to higher fertility in some northwestern countries in the mid-1960s. Neither the larger birth cohorts of 1945–1948 nor theories of a return of social and economic confidence after the postwar reconstruction years are fully convincing as explanations. It is interesting that this upward fertility trend occurred in countries without explicit population policies. In eastern Europe, on the other hand, there is little doubt that the analogous rise in fertility since about 1970 is largely the result of policies aimed at this end. In any event, the episode was a brief one, and by the early 1970s most of Europe (except eastern Europe) was again clearly set on downward fertility trends. The extreme instance is that of West Germany, where fewer births than deaths have been recorded in each year since 1972. These general trends are illustrated in Table 2, summarizing the trend in crude birth rates, and Table 6, which sets out the trend in the total fertility rate.

Perhaps special mention should be made of Ireland (Eire); the Irish crude birth rate since 1955 has not fallen below 21 nor exceeded 22.7, a most extraordinary degree of consistency in a relatively flexible index of social change.

The overall impression of falling fertility is best shown as a process in its effects on age-specific fertility. The process involves concentration of family building in a shorter period, predominantly in the age groups 20–29. The trend to early marriage (a mean age of about 22 for women and 24 for men) has been slightly checked and there is some evidence that births to women under 20 are also slightly reduced in some countries. But the most striking change is in births to women over 30, which have declined substantially in recent years.

The complexities of the European situation are nicely illustrated in Table 7. Italy is less demographically "advanced" than France or the United Kingdom and accordingly still shows a slight increase in fertility among younger women. Hungary shows increase all round as the decade 1966–1975 was one of deliberate policy pressure to attain higher fertility in eastern Europe; on the other hand, East Germany shows more "mature" trends in this context, comparable to those recorded for France, West Germany, and the United Kingdom.

A crucial issue arising from declining fertility is the prospect of an actual reduction in population size in some European countries. This is a less simple notion than appears. First, ignoring migration, it depends on the relationship between births and deaths as to what gain or loss is recorded in any period, and these two respond to quite different sets of determinants. Second, the total population depends on the cumulative effect of fertility and mortality trends over many decades, and their mutual effects on age structures. The higher fertility of the 1960s, for example, will not lose its final effect on total population until well into the twenty-first century. Central to this concept is the idea of "replacement" of one generation by another, which depends on how far adult females are replaced by their daughters in the next generation. Because of the sex balance at birth (about 105 males to 100 females) and the slight but inevitable loss of life in infancy and childhood, an average of 2.15 live births per adult woman completing her reproductive

TABLE 6. *Total fertility rates, selected countries, 1960–1979*

Region/Country	1960	1965	1970	1975	1978–79
Eastern Europe					
Hungary	2.02	1.82	1.96	2.37	2.02
Poland	—	2.52	2.20	2.28	2.27
Romania	2.34	1.91	2.89	2.62	2.54
Northwestern Europe					
France	2.73	2.84	2.47	1.92	1.87
United Kingdom	2.67	2.83	2.44	1.79	1.87
West Germany	2.37	2.51	2.01	1.45	1.40
Southern Europe					
Italy	2.37	2.65	2.39	2.19	1.71
Spain	2.79	2.95	2.86	2.76	2.53

TABLE 7. *Age-specific fertility, selected countries, 1966–1975*

Country	Aged 15–19		Aged 30–34	
	1966	1975	1966	1975
East Germany	64.2	61.6	71.1	28.9
France	27.2	25.8	107.1	66.8
Hungary	46.1	67.5	48.6	59.9
Italy	25.8	32.9	117.2	89.8
United Kingdom	47.7	36.8	98.0	58.7
West Germany	33.6	21.1	102.7	52.2

cycle is necessary to ensure the replacement of the female population. As a number of women are sterile or seriously subfertile (in Europe about 7 percent), and an increasing number of women remain childless, it is clear that a significant number of women must have more than two children to support the average of 2.15. This is the significance of Table 6, which shows the total fertility rate: the number of children a woman would have if she followed the age-specific fertility rates registered in a particular calendar year. It must be noted that this index is synthetic and that the actual completed fertility of present cohorts is likely to be higher than the lower period indexes suggest, since some of their experience was already established before the recent declines.

Because some women remain childless, the maintenance of a 2.15 average depends upon at least some women having three or more births. There is growing concern in some countries, notably in France, about the question of how many women will continue to have the third or fourth child. In fact, in most countries a declining percentage of all births are of the third or fourth order, and this helps to account for the overall fertility fall. The decline in higher order births has become a prominent demographic issue in both eastern and western Europe. It should be noted that between 1966 and 1975 the absolute number of live births *declined* by 14 percent in Italy, 22 percent in the Netherlands, 29 percent in the United Kingdom, and 40 percent in West Germany.

Migration. During the last hundred years Europe has twice been a major theater of migration. From the middle of the nineteenth century to 1914, Europe exported people in rising numbers, eventually reaching a total of about 1 million emigrants a year, most of whom went to North America. Since World War II, another great European migration movement has occurred, a flow *into* Europe from North Africa and Turkey, and a flow *within* Europe from Mediterranean countries to northern and western Europe. In addition the United Kingdom has experienced a very considerable immigration of New Commonwealth citizens from South Asia, Africa, and the Caribbean. Various estimates between 1970 and 1975

give totals of 12.5 to 13.5 million aliens (foreign-born) living in Europe. The majority of these were Europeans who had moved from one country to another, and many of them intended to return home after two or three years. There are two principal population elements in this situation. The core component is the large number of young adult workers, mostly men, who have moved from Greece, Italy, Portugal, Spain, and Yugoslavia, and also from North Africa and Turkey, into Belgium, France, the Netherlands, Switzerland, and West Germany. They came seeking work, usually on a temporary basis controlled by systems of work permits. The second major component is the number of family dependents joining these workers; by the late 1970s this second group might be roughly equivalent to the numbers of foreign workers in any one country. Many wives and children have, or will, become permanent residents seeking citizenship along with their husbands.

Apart from the major migrant streams there are more local movements such as those between the Scandinavian countries, and between Eire and the United Kingdom. There has been no significant comparable movement between the countries of eastern Europe, or between these countries and the other regions of Europe since 1960. Before then, the postwar differences between "East" and "West" set numbers of people on the move; for example, from 1950 to 1961, when the frontier was closed, there was net migration from East Germany into West Germany of more than 3 million persons.

The pull from the Western receiving countries was quite specific as official agencies were set up in the 1950s and early 1960s to attract foreign workers to make up deficiencies in national labor forces, and to support rapid economic growth. The push from the sending countries was basically an old problem revived. In the countries of southern Europe and in North Africa and Turkey, economic development had failed to keep pace with demographic growth, and increasing numbers of young men seeking work chose to leave countries of traditional peasant economies and cities with serious poverty problems for countries with booming urban industries and modern consumer societies. The contribution made by these migrants to the long-term demographic growth of the host country is not easy to measure but is significant, with important economic and social implications.

Table 8 gives a general picture of the scale and direction of the movement of migrant workers, but it is important to keep in mind that the total of foreign residents in any one country may be greatly in excess of these figures. In 1976 there were 317,000 foreign workers in Belgium but over 800,000 foreign residents; in France the figures were 1,584,000 and 4,200,000 respectively, in West Germany 1,949,000 and 3,948,000, and in Switzerland

TABLE 8. *Foreign workers in residence, selected countries, 1975–1976 (in thousands)*

Emigrant countries	Immigrant countries				
	Belgium	France	Sweden	Switzerland	West Germany
Austria	1.0	—	3.1	20.4	76.0
Greece	10.0	—	9.0	5.2	178.8
Italy	96.0	199.2	3.0	261.6	276.4
North African countries	33.5	556.4	1.0	—	29.0
Portugal	6.0	360.7	1.1	4.1	63.6
Spain	30.0	204.0	1.9	68.9	111.0
Turkey	16.0	31.2	3.8	15.2	527.5
Yugoslavia	3.0	42.2	27.0	24.1	390.1
Others	121.3	190.6	185.6	116.6	296.1
Totals	316.8	1,584.3	235.5	516.1	1,948.5

Source of data: Organisation for Economic Co-operation and Development, 1977.

516,000 and 959,000. These are examples of a very complex situation. A further difficulty is the return flow of workers whose permits have expired. Italy will serve as an example; from 1951 to 1971 about 3,900,000 workers left Italy and about 2,720,000 returned. Between 1971 and 1973, 344,000 emigrated and 321,000 returned. In 1975 and 1976, 198,000 returned and 145,000 emigrated, that is, there was a net inflow. It is not possible to produce comparable figures for the United Kingdom, but it might be noted that in 1971 there were 1,150,000 residents born in the New Commonwealth countries, and that from 1971 to 1976 *net* immigration from the New Commonwealth totaled 171,000. It is possible that about 30 percent of this total of 1,320,000 will be workers in the sense used in Table 8. To this should be added about 355,000 foreign workers of European origin (60 percent from Eire). The U.K. figure that might be compared with Table 8 then is about 750,000.

These movements were primarily economically motivated. Migrant labor flowed from countries with relatively weak economies to those with much stronger economies. In one sense, the whole movement could be seen as an entirely spontaneous response to the needs of the times, a primitive and unplanned form of European economic cooperation, with benefits to both the sending and receiving countries.

The recession of the early 1970s brought an abrupt end to this large-scale flow into and within Europe, which had continued for about twenty years. West Germany in late 1973 began restricting the admission of immigrants from outside the European Economic Community (EEC). By the end of 1974, France, Belgium, and the Netherlands had followed with full enforcement of control regulations and with much stricter control of clan-

destine immigration and illegal employment of foreign labor. France restricted entry to North Africans, who had been coming fairly freely since 1960, and Algeria suspended emigration to France from September 1973. The effects of such measures were dramatic. Emigration from Yugoslavia and Turkey into western Europe virtually stopped in 1974. In the first half of 1973, 72,000 Spaniards emigrated to other European countries, but only 2,200 in the second half. In 1973, 120,000 emigrants left Portugal but in 1975 only 45,000, and of this number four-fifths were wives and dependents joining husbands abroad. It now appears that the complex to-and-fro movement with Europe, involving over a million people a year at its peak, has subsided to be only a minor factor in the near future. The central reason for the changes of policy was increasing unemployment in the host countries, and particularly unemployment among the young; but the issue is political as well as economic. There remains free flow of labor among full members of the EEC; Greece is now a member and Portugal and Spain are close to membership.

The Future. The present European population situation suggests a continuing trend in most of Europe towards low fertility and low mortality, with high marriage rates and small family size, including some increase in childless women. In eastern Europe, however, official policies aim to sustain higher fertility and support steadily increasing population totals. Where such policies operate in northern and western Europe they are positive in the sense of higher family benefits aimed at encouraging third and fourth children (e.g., in France), and in the context of official blessings on the social and moral values of family and community life. In eastern Europe, population policies are negative in the sense of restrictions upon

TABLE 9. *Abortions and live births in Hungary and in England and Wales, 1967–1978 (in thousands)*

Country	1967	1969	1971	1973	1975	1978
Hungary						
Abortions	187.5	206.8	187.4	169.7	96.2	83.5
Live births	148.9	154.2	150.5	156.2	194.2	168.2
England & Wales						
Abortions	—	54.8	94.6	110.6	106.2	112.1
Live births	832.1	797.5	783.2	675.9	603.4	596.4

fertility control systems, notably abortion provision, but also conventional contraceptive supply, both of which are state monopolies. It is interesting to compare the legal abortion figures with total live births in Hungary and in the United Kingdom (England and Wales only). The effect of new legislation in Hungary in 1973–1974 to make abortion less easily available is clearly seen in Table 9. In England and Wales there has been no change in the operation of the Abortion Act since it took effect in 1968. The classic case of a policy decision affecting fertility is that of Romania in 1966. In 1965 Romania recorded 278,362 live births and 1,115,000 abortions; in 1967, 527,764 live births and only 51,700 abortions. This was the effect of Decree No. 770/1966, which stopped abortion on request and imposed strict regulation by age, family size, and medical referral.

It is probable that all European countries with the exception of West and East Germany will have larger populations in the year 2000 than in 1975. Developments after 2000 will increasingly depend on fertility trends over the next two or three decades and the way they affect the age structures. Although we lack satisfactory models on which to build confident forecasts of fertility behavior, it is most likely that there will be some fluctuations but that these will not be greater in range than the variations of the last twenty-five years, and may be less. Table 10 sets out projections to the year 2000 for the larger national populations.

Of greater concern to governments in a time of low or falling fertility is the probable shift in age structure during the not too distant future. Table 11 sets out some estimates of broad age groupings and shows the expected trend toward a smaller proportion of children and young people and some increase in the elderly with less-marked changes in the adolescent and adult population, the economically active age groups. The apparent large increase in this age group in West Germany is very deceptive; although a small absolute increase in the numbers aged 15–64 is expected, the chief factor is the remarkable decline in numbers aged under 15 (36 percent).

These projections suggest less cause for economic and political alarm than is frequently expressed. They also indicate a degree of consistency in the pattern of regional variation in demographic trends in Europe as a whole. The northern and western countries are more "mature" in demographic terms than the southern countries, and eastern Europe shows the results of political interest in future population totals.

Conclusions. An important question remains after consideration of demographic trends in Europe. If the present expectation of a slowing of growth toward relative stability, and possibly of decline in particular countries, is a logical outcome of the overall trends of the last century and a half, is this likely to occur elsewhere in the world? Such a conclusion would be too simple a presentation of the complex interaction of demographic processes with the processes of political and economic change in a world of widely disparate cultures. Fertility levels in developing countries appear, at least in some circumstances, to fall in the absence of European-style socioeconomic changes, and the experience of the United States, the Soviet Union, and Japan must be built into any such general thesis. But Europe's population history is one of convergence from national diversity towards a degree of similarity chiefly characterized by low and falling growth rates. This could yet prove an encouraging signpost for most of the rest of the world.

Maurice Kirk

TABLE 10. *Population projections, selected countries, 1975–2000*[1]

Country	1975	2000	
France	52,750	59,573	(112.9)
Italy	55,812	60,392	(108.2)
Poland	34.020	38,536	(113.3)
Romania	21,180	27,771	(131.1)
Spain	35,470	45,449	(128.1)
United Kingdom	56,023	57,525	(102.7)
West Germany	61,832	58,718	(94.9)
Yugoslavia	21,330	25,653	(120.3)

[1]Totals in thousands; indexes to 1975 = 100.

See also ABORTION, *article on* INDUCED ABORTION; HISTORICAL DEMOGRAPHY; INTERNATIONAL MIGRATION; SOVIET UNION; URBANIZATION, *article on* DEVELOPED COUNTRIES.

TABLE 11. *Population projections, selected countries, by age groups, 1975–2000*

Country	1975, by age groups			2000, by age groups		
	−15	15–64	65+	−15	15–64	65+
France	24.2%	62.3%	13.5%	21.5%	64.3%	14.2%
Italy	24.2	63.8	12.0	21.5	63.3	15.2
Poland	30.3	58.3	11.4	23.4	61.5	15.1
Romania	26.5	64.1	9.4	27.1	62.2	11.7
United Kingdom	22.5	63.5	14.0	22.0	63.8	14.2
West Germany	21.5	63.3	15.2	14.6	70.0	15.4
Yugoslavia	27.6	65.6	8.5	25.6	63.0	11.4

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F

FAMILY LAW

The following article is limited to a discussion of family law in the United States.

"Family law" refers principally to laws dealing with (1) the formation of marriage, (2) grounds for divorce, (3) child custody after separation or divorce, (4) the economic consequences of divorce, (5) antenuptial agreements altering ordinary marital arrangements, (6) illegitimacy, and (7) cohabitation without marriage and the economic consequences of termination of such nonmarital relationships. This article describes the first two of these aspects of family law in the United States and summarizes principal features of the remaining five. At the outset, however, a caveat is in order. In general, there is no uniform body of "family law" in the United States. Instead, each of the fifty states has its own body of law relating to family matters. Generalization is thus a hazardous enterprise, except in those areas in which federal law, constitutional or statutory, sets outside limits on state regulation. A further complication to be noted is the fact that since 1965 revolutionary changes have occurred in the United States in the area of family law. Significant legal developments have included (1) liberalization of divorce laws; (2) equalization of rights and responsibilities of men and women in the areas of child custody and child support as well as spousal support, maintenance, and property distribution; and (3) increasing recognition of the constitutional right of children born out of wedlock to equality under the law.

Formation of Marriage. In every state the formation of the marriage relationship is regulated by statute. Statutory provisions govern licensing and the solemnization of marriages and, more importantly, establish, among other things, the minimum age at which the parties can legally marry, the relationships, whether of consanguinity or affinity, that will foreclose marriage between two parties, and, in some states, the mental capacity that must exist before a valid marriage can come into being.

Although the law affecting domestic relations is considered virtually exclusively the province of the states, the U.S. Constitution establishes some limitations upon a state's power to regulate the freedom to marry. The United States Supreme Court has repeatedly recognized the fundamental importance of the right to marry under the Constitution, and it is now well established that the right to marry is part of the fundamental right of privacy implicit in the Fourteenth Amendment's Due Process Clause. Accordingly, as the Supreme Court observed in *Zablocki* v. *Redhail*, state regulations that interfere with that right must be subjected to rigorous scrutiny.

Which of the existing state laws regulating the formation of marriage require "rigorous scrutiny" and which do not is, at present, uncertain since the Supreme Court has not had occasion to determine whether or not the regulations described below are, in all respects, constitutionally valid.

Formalities. In all states in the United States, statutes have been enacted that require the parties to obtain a license before they marry and to comply with the rules governing formal solemnization of the marriage. None-

theless, it is still possible in a few states for the parties to enter into a common law marriage. A valid common law marriage is as binding as a valid ceremonial marriage, although this fact often is not clearly understood by the people involved. In any case, technically, all that was historically required in order to establish a common law marriage was proof that the parties agreed, in words of the "present tense," to live together as man and wife, although words of future intent, followed by consummation, would also suffice. In the ordinary case, the agreement to marry, which is the crux of the common law marriage, cannot be established directly; instead, cohabitation by the parties, combined with their reputation as husband and wife, is usually established; then, from the evidence of cohabitation and reputation, the parties' agreement may be inferred.

Age restrictions. In most states, the minimum age for marriage without parental consent is 18. At one time, many states set a higher minimum age for marriage of males than for females. However, such age-sex distinctions are much less common today, and are almost certainly unconstitutional. Most states also have enacted statutes that establish a lower minimum age at which a person can marry with parental or judicial approval or consent or both, although some provide that the minimum age requirements are inapplicable if the female applying for the marriage license is pregnant.

Mental state. The minimum age requirements just discussed reflect, at least in part, concern as to the minor's maturity and mental capacity to enter into a marriage contract. However, other statutory provisions more directly and generally address the issue of mental capacity. Thus, some states expressly proscribe the issuance of marriage licenses to certain mentally incapacitated persons. Typically, however, the question of mental capacity is raised only *after* the marriage has taken place, when an annulment is sought on the grounds of a party's mental incapacity at the time the marriage was celebrated. In these annulment cases, the courts tend to require a strong showing of mental incapacity, and it appears to be the general rule that a derangement must be so marked that it prevented the afflicted party from comprehending the nature of the contract and from giving to it his or her free and intelligent consent.

Kinship limitations. Laws prohibiting marriage between certain closely related persons exist in every state. The statutory provisions establishing kinship limitations on marriage vary as to the degrees of relationship proscribed and whether the proscriptions apply not only to blood relatives but also to relatives by adoption or by marriage or both. In some states, proscriptions based upon an affinity relationship cease to apply once death or divorce has ended such relationship; in others, the proscription continues irrespective of the severance of the relationship. Some states make clear that adoptive relationships are included in some or all of the statutory proscriptions; others do not.

Other limitations and regulations. Eugenic considerations are expressed in statutory provisions that, in a few states, seek to encourage premarital genetic counseling. However, these statutes do not proscribe marriage between carriers of various genetic diseases; instead, they simply attempt to educate such carriers. Until fairly recently, regulatory statutes in a number of states prohibited marriage where one of the parties suffered from certain physical conditions, including epilepsy, tuberculosis, and venereal disease. Today, the statutes denying the right to marry to persons suffering from epilepsy have been abolished throughout the country, and statutes regulating marriage by persons who suffer from tuberculosis are rare. However, statutes requiring *testing* for venereal disease continue to be common, although only a few states proscribe marriage by persons suffering from such diseases.

In recent years in a number of states, couples of the same sex have unsuccessfully sought marriage licenses. Constitutional challenges, on equal protection and other grounds, to marriage regulation statutes that, explicitly or implicitly, require that marriage partners be of different sexes, have uniformly failed. Where, however, a person prior to marriage has undergone a sex-change operation, at least one American court has held that a marriage between a male and a postoperative transsexual (whose apparent sex was changed from male to female) was a lawful marriage between a man and a woman, at least where the male had known that the female had previously undergone sex reassignment surgery.

Grounds for Divorce. Traditionally, divorce was granted in almost all states in the United States only on "fault" grounds. Beginning in the 1960s, divorce on "no-fault" grounds became the focal point of divorce law reform in many states. Before turning to the current trend favoring "no-fault" divorce, it is appropriate here to review, albeit briefly, the traditional fault grounds and the defenses thereto.

Fault grounds and defenses. One of the most widely recognized fault grounds for divorce in the United States is adultery. As of 1 August 1980, approximately thirty-six states still listed adultery as a ground for divorce.

Another frequently recognized fault ground is desertion, or abandonment. In the approximately thirty-six states whose statutes expressly include this ground for divorce, the abandonment or desertion must persist for a specified time period before a petition for divorce may be

filed. The required period varies from state to state, with one year being the one most often provided for by statute.

A third frequently recognized ground for fault divorce is cruelty. Originally, divorce on this ground was available only in cases involving bodily harm or a reasonable apprehension thereof. However, over time, this ground for divorce was greatly expanded by the legislatures or the courts or both in many states to include mental cruelty.

Of all of the fault grounds, mental cruelty is potentially capable of the most expansive reading, and in some states, cruelty divorces are granted on proof of relatively innocuous conduct.

In addition to the fault grounds described above, one or more of the following fault grounds may be among those specified in the divorce statutes of some states: habitual drunkenness, drug addiction, incurable impotence, conviction of a felony or imprisonment for a specified length of time or both, and nonsupport or neglect.

Growth of "no-fault" divorce. One of the most remarkable trends in family law in the United States has been the growth of "no-fault" divorce. According to two eminent family law authorities in the United States, Doris Jonas Freed and Henry H. Foster, as of 1 August 1980 there were only two states that still provided "fault only" grounds for divorce (Freed and Foster, 1980). There is, however, enormous variation among the states as to the kinds of no-fault provisions that have been adopted and as to whether "no-fault" has replaced the fault grounds, or whether it has simply been added to the statutory fault divorce framework as an alternative ground for divorce. Although the law of no-fault divorce is rapidly changing, a brief résumé of the principal patterns of no-fault divorce legislation and of some of the issues such legislation raises is possible.

The most important categories of "no-fault" divorce provisions are the following:

1. *Incompatability of temperament.* Incompatability of temperament is a ground for divorce in perhaps a half dozen states. Although, on its face, incompatability clearly appears to be a no-fault ground, judicial interpretation in some states has reintroduced notions of fault here.

2. *Living separate and apart for a specified period of time.* This no-fault ground includes a number of subcategories, some of which are, perhaps, more closely akin to either "fault" or "consent" divorce than to "no-fault" divorce. In a number of states, a judicial separation decree may, at the behest of either party, be converted to a decree of divorce after the parties have lived apart pursuant to such separation decree for a specified period of time. Another approach permits divorce when the parties have lived apart voluntarily for a specified period of time. In some states the separation must be pursuant to a written separation agreement. In others, it is sufficient that the parties separated by mutual consent, and that the consensual nature of the separation continue throughout the entire statutorily required time period.

3. *Marital breakdown; "no-fault" divorce.* The pioneer state in providing marital breakdown as a ground for divorce was California. Its statute, as originally enacted in 1970, stated, in pertinent part, that "a court may decree a dissolution of the marriage or legal separation on either of the following grounds, which shall be pleaded generally: (1) irreconcilable differences which have caused the irremediable breakdown of the marriage; (2) incurable insanity." It further defined irreconcilable differences as "those grounds which are determined by the court to be substantial reasons for not continuing the marriage and which make it appear that the marriage should be dissolved."

According to Foster and Freed (1980), as of August 1980, thirty-five states had enacted statutes establishing breakdown of the marriage as a ground for divorce. In approximately seventeen of these states, marital breakdown is the sole ground for divorce except that in a few of the "pure no-fault" states, including California, insanity is also recognized as a ground for divorce. In the remaining states, breakdown of the marriage has been added to traditional statutory grounds of fault, living apart, and certain others.

Once again, diversity exists among the states that have enacted statutes providing that marital breakdown is a ground for divorce. Moreover, a number of the marital breakdown statutes are quite similar to some of the "living separate and apart" statutes. Among the existing variations in the marital breakdown provisions are the following. (1) In some states, the parties must live apart for a period of time (usually relatively short) before they can obtain a divorce on marital breakdown grounds. In other states, a set time period must elapse (again, usually relatively short) between the time when a party files suit for such divorce and the time when a court hearing is held. In such states, depending on the length of the time period, the marital breakdown ground may be very like the "living separate and apart" statutes of some states. (2) In a few states, when one party contests a divorce sought on marital breakdown grounds, the statutes may begin to resemble traditional fault statutes. For example, in Missouri, if irretrievable breakdown is contested, breakdown can be proven only by fault grounds or living apart for two years or living apart by mutual consent for one year. (3) Some states have defined "irretrievable breakdown"

so as to permit or, in some cases, require proof of fault. In some states, questions may also arise as to whether, even if evidence of fault is inadmissible on the issue of divorce, it may nonetheless be taken into account in determining alimony, property division, child support, or child custody. California's statute, however, has made clear that "evidence of specific acts of misconduct shall be improper and inadmissible, except where child custody is in issue and such evidence is relevant to that issue."

One final observation is in order before concluding this brief discussion of the statutes on marital breakdown. A recurring question, one that has been much mooted, is that of how much judicial discretion there is, or ought to be, to deny a marital breakdown divorce in contested cases. Under many of the broadly worded statutes, it is unclear whether the standard for breakdown is objective or subjective, and whether the court has a real role to play in deciding whether "marital breakdown" has been established. It is, however, interesting to note that even where divorce under broadly worded marital breakdown statutes has been contested, it has virtually never been denied for failure of proof of such "breakdown."

Child Custody after Separation or Divorce. In disputes between divorced or separated parents over the custody of minor children, most courts in the United States adhere to the "best interests of the child" standard. This standard, while simply stated, is extraordinarily difficult to apply. In most states, the courts rather than the legislatures have developed criteria and guidelines for the application of this general standard. In some states, however, statutes also set forth specific factors that may (or must) be considered by the courts in making their determinations. For example, one state, Minnesota, sets forth the following factors as included in a determination of the best interests of a child: "(a) the wishes of the child's parent or parents as to his custody; (b) the reasonable preference of the child, if the court deems the child to be of sufficient age to express preference; (c) the interaction and interrelationship of the child with his parent or parents, his siblings, and any other person who may significantly affect the child's best interests; (d) the child's adjustment to home, school, and community; (e) the length of time the child has lived in a stable, satisfactory environment and the desirability of maintaining continuity; (f) the permanence, as a family unit, of the existing or proposed custodial home; (g) the mental and physical health of all individuals involved; (h) the capacity and disposition of the parties to give the child love, affection, and guidance, and to continue educating and raising the child in his culture and religion or creed, if any; and (i) the child's cultural background."

A number of courts and legislatures have formulated what amount to rules of preference or legal presumptions in child custody cases. For example, until fairly recently, many states recognized a "maternal preference," especially in custody cases involving children of "tender years." Often the maternal preference created a rebuttable presumption that a custody award to the mother was in the best interests of a young child. However, in the 1970s, the prevalence of this maternal-preference rule or presumption decreased markedly, and awards of custody to men in contested cases have become more frequent. In states that have ratified the Equal Rights Amendment, it is clear that a "maternal preference" is unconstitutional, and under current Equal Protection Clause analysis, it is probably unconstitutional under the Fourteenth Amendment to the U.S. Constitution as well.

In the past few years, judicial and legislative attention has focused increasingly on joint custody as an alternative to the traditional approach of awarding custody to one parent and visiting privileges to the other. Joint custody, basically, is an arrangement whereby the parents have joint control of the child's education and upbringing; it may include divided physical custody as well. Definitions vary, however, as to just what joint custody is.

Because of the emphasis upon the child's best interests in custody awards, it has long been the law in the United States that custody decrees are not final. The general rule is that the party seeking a modification of a custody decree must show a change of circumstances that requires that custody be changed in order to promote the child's best interests. To promote a stable environment for the child, courts and legislatures in recent years have attempted to lessen the ease with which custody decrees can be modified, and the incentive for seeking a state which may give a more favorable decree. In addition, federal legislation has recently been enacted to ensure greater respect by a state for the custody decrees of another state.

Economic Consequences of Divorce. When a divorce is granted, courts are authorized by state law to make orders relating to money and property. Depending upon state law, child support as well as spousal support, maintenance, or alimony in the form of periodic payments may be awarded. In addition, property, tangible and intangible, may be divided. However, marked differences exist among the states as to the economic consequences of divorce for the spouses involved.

Alimony or maintenance. Traditionally, by statute, postdivorce alimony, usually in the form of periodic payments, was solely an obligation of ex-husbands. This law has changed considerably in recent years.

Prior to 1979, a number of states had amended their statutes to eliminate sex-based distinctions regarding alimony. In 1979, the U.S. Supreme Court held that an Alabama statute that imposed alimony obligations only on ex-husbands violated the Equal Protection Clause of

the Fourteenth Amendment (*Orr* v. *Orr,* 1979). As a result of the decision in *Orr,* it is now clear that state laws authorizing awards must be "gender neutral."

Alimony payments usually continue until the alimony recipient's death or remarriage. Some states, however, have made increasing use of rehabilitative alimony. The notion underlying rehabilitative alimony is that in some cases, a transition period of a few years is necessary to enable an economically dependent spouse to reenter the job market and to become self-supporting, and that when that transition period has ended, alimony should also cease.

Property division. In more than forty states, courts have the power to divide property upon divorce in accordance with either community property or common law principles. In approximately eight states, community property principles control property distribution on divorce. In the majority of the states, common law, as opposed to community property, principles apply, and the courts have the power to distribute property "equitably." In the remaining states, courts lack the power to distribute property upon divorce. Where the power to divide or distribute property is lacking, postdivorce allocation of property is governed mainly by considerations of legal title.

Child support after divorce. In every state, statutes impose upon parents the obligation to support their children. Until fairly recently, child support, by statute, was regarded primarily as the father's responsibility, with the mother generally held liable only in the event that the father either failed in his duty to support or died. Today, in many states, statutes specifically provide that both parents are equally responsible for the support of their children. Moreover, in view of the most recent developments in the U.S. Supreme Court's analysis of the Equal Protection Clause, state statutes that continue to place primary financial obligation on fathers are probably unconstitutional, and a number of state courts have so held.

One of the most difficult problems with respect to child support is the question of what standards govern judicial awards of such support. By and large, the states have not provided detailed statutory criteria for child support. However, case law and statutes often set forth certain specific factors that should be considered. For example, the Uniform Marriage and Divorce Act states that the court "may order either or both parents owing a duty of support to a child to pay an amount reasonable or necessary for his support, without regard to marital misconduct, after considering all relevant factors including: (1) the financial resources of the child; (2) the financial resources of the custodial parent; (3) the standard of living the child would have enjoyed had the marriage not been dissolved; (4) the physical and emotional condition of the child and his educational needs; and (5) the financial resources and needs of the non-custodial parent" (National Conference, 1974).

Antenuptial Agreements. Until fairly recently, the only antenuptial agreements that were enforceable in the courts were those regulating inheritance rights after death or those that simply involved transfers of property in consideration of marriage. If these narrowly confined antenuptial agreements were fair and reasonable and were based on full disclosure as to financial assets, they would be enforced by the courts. By contrast, all premarital contracts attempting to regulate the rights of the parties to support or property distribution or both in the event of divorce were generally unenforceable. At present, these traditional rules are in a state of flux. While the courts in many states still adhere to the general rule that parties, through an antenuptial contract, cannot validly regulate the disposition of property or the amount of alimony awarded on divorce, some state courts as well as some legislatures have abandoned the rule that automatically voided such contracts and have considered instead whether the specific agreement was fair and equitable when made.

Illegitimacy and the Law. In 1968, with its decisions in *Levy* v. *Louisiana* and *Glona* v. *American Guarantee and Liability Insurance Co.,* the U.S. Supreme Court began the process of "federalizing" the laws affecting the rights and responsibilities of illegitimate children and their parents. In the first case, *Levy* v. *Louisiana,* the Court held that the Louisiana wrongful death statute barring illegitimate children, simply because they *were* illegitimate, from recovering money damages for the death of their mother violated the Equal Protection Clause of the U.S. constitution. In the latter case, *Glona* v. *American Guarantee and Liability Insurance Co.,* the Court similarly held it a violation of the Equal Protection Clause for the state to deny the mother of an illegitimate child the right to recover in a wrongful death action merely because the child who had been killed was illegitimate.

These and subsequent illegitimacy cases have engendered a great deal of disagreement among the members of the Supreme Court. The cases that have given most trouble have involved claims for postdeath benefits and intestate inheritance when the claimant is either the illegitimate child or the alleged father.

Much less difficult has been the question, also decided by the Supreme Court, of the illegitimate child's right to support during the father's lifetime. At common law, fathers were not legally required to support their out-of-wedlock children. Most states had enacted statutes altering the common law rule so as to require paternal support if paternity was established in accordance with state law; however, a few states had not. In 1973, the Supreme

Court declared that "once a state posits a judicially enforceable right on behalf of children to needed support from their natural fathers, there is no constitutional justification for denying such an essential right to a child simply because its natural father has not married its mother" (*Gomez* v. *Perez,* 1973). As a result, it is no longer permissible for states to impose a paternal support obligation solely with respect to legitimate children.

Cohabitation without Marriage. The much-publicized case of *Marvin* v. *Marvin* (1976) brought to public notice a question that courts, with increasing frequency, have faced: what are the economic rights and obligations of unmarried cohabitants when their relationship terminates? Traditionally, the courts in the United States refused to enforce express economic contracts between unmarried couples if the provision of "sexual services" furnished even part of the consideration for an agreement to, for example, provide support, or divide or otherwise dispose of property. On the other hand, purely economic express agreements, at least theoretically, could be enforced. In addition, where property was jointly accumulated, it could, upon termination of the relationship, be divided in proportion to each party's monetary contribution; nonmonetary contributions of, for example, homemaking services were not taken into account. Efforts to enforce implied agreements also met with little success under the traditional judicial approaches.

The increased incidence of nonmarital cohabitation, combined with a growing recognition of the inequities resulting from the traditional approaches, and a change in many states' laws affecting the legality of unmarried cohabitation, have precipitated serious reexamination of these traditional rules. However, the results of recent court decisions are far from uniform, and continued judicial, as well as legislative, activity is to be expected.

Although the California Supreme Court's opinion in *Marvin* v. *Marvin* in most respects has not been widely followed, it provides a useful point of departure in an examination of the legal approaches possible in this area.

In its wide-ranging opinion, the court concluded that, "except to the extent the contract is explicitly founded on the consideration of meretricious sexual services," express contracts between nonmarital partners as to their earnings and property rights are enforceable. Moreover, "even if sexual services are part of the contractual consideration, any severable portion of the contract supported by independent consideration will still be enforced." The court then went on to state its conclusion that "in the absence of an express contract, the courts should inquire into the conduct of the parties to determine whether the conduct demonstrates an implied contract, agreement of partnership or joint venture or some other tacit agreement between the parties." Finally, the court concluded "a nonmarital partner may recover . . . the reasonable value of support received if he can show that he rendered services with the expectation of monetary reward."

The court's holding in *Marvin* that express contracts, written or oral, are enforceable, is the least controversial aspect of the case, and a number of courts have followed the California approach, although other courts have adhered to the strict view that finds an express agreement completely unenforceable if sexual services formed any part of the contractual consideration.

Somewhat more controversial is the *Marvin* court's conclusion that implied contracts are enforceable. Quite apart from the traditional public policy considerations previously discussed in connection with express agreements, it is unclear just how far courts of other states will go in enforcing implied in-fact agreements.

Conclusions. Rapid change has been a distinctive feature of family law during the past decade, and many of the legal rules governing marriages and divorce as well as nonmarital cohabitation, spousal support and property distribution, child custody, and illegitimacy are still evolving. Equality of the sexes is rapidly becoming the norm in matters relating to custody and child support as well as alimony and property distribution, and the areas in which parties, married and unmarried, are free to decide upon their living arrangements, and the economic consequences that flow from the termination of such arrangements, are growing. Thus, the law of domestic relations, while continuing to seek the necessarily delicate balance between individual freedom and governmental control, has increasingly sought to honor the reasonable expectations of the individuals whose conduct, status, and relationships it touches.

Ruth Jane Zuckerman

See also LAW AND FERTILITY REGULATION, *article on* UNITED STATES; MARRIAGE AND DIVORCE.

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FAMILY PLANNING

"Family planning" refers to planning on the part of women, men, or couples to have the number of children they want when they want them. The term usually refers to temporary methods of contraception, but sterilization is frequently included and abortion sometimes is. Related terms used commonly in various parts of the world include "birth control," "birth planning," "birth limitation," "child spacing," "fertility control," "fertility regulation," "planned parenthood," "responsible parenthood," and "voluntary parenthood."

Five articles in this work directly related to family planning are grouped under the heading FAMILY PLANNING PROGRAMS. The organization and evolution of, rationale for, and approaches to delivering family planning services in developing countries as well as aspects of program performance and characteristics of program acceptors are discussed in the article on DEVELOPING COUNTRIES. In NONCLINICAL PROGRAMS are described the growth of community-based and household-based systems, and social marketing approaches for distribution of contraceptives. In UNITED STATES, the history and development of federally assisted family planning activities are discussed. The principal management and evaluation techniques used by administrators of family planning programs are discussed in MANAGEMENT AND EVALUATION. Finally, evaluative methods employed to measure the effects of family planning programs upon fertility are reviewed in EFFECTS ON FERTILITY.

Topics that are of interest to those responsible for planning or evaluating family planning programs, for example, Knowledge Attitude Practice Surveys, but that may not be directly related to the daily management of such programs, can be found in FAMILY PLANNING RESEARCH.

The history of the development and spread of family planning programs is recounted in BIRTH CONTROL MOVEMENT.

Related entries are ABORTION; CONTRACEPTIVE METHODS; CONTRACEPTIVE USE; ETHICS; LAW AND FERTILITY REGULATION; and STERILIZATION TECHNIQUES. Many entries on countries and regions also provide information on family planning programs.

FAMILY PLANNING PROGRAMS

1. DEVELOPING COUNTRIES — Walter B. Watson
2. NONCLINICAL PROGRAMS — Martin E. Gorosh / James R. Foreit
3. UNITED STATES — Joy G. Dryfoos
4. MANAGEMENT AND EVALUATION — Martin E. Gorosh
5. EFFECTS ON FERTILITY — Albert I. Hermalin

1.
DEVELOPING COUNTRIES

Family planning programs are organized programs—often governmental in sponsorship, support, administration, facilities, and personnel, but frequently involving private efforts (family planning associations, private physicians) and occasionally commercial ones—designed to provide the information, supplies, and services of (modern) means of fertility control to those interested. Such programs frequently have a persuasional component as well, advocating the small-family norm and the use of contraception; but in most programs that element has not been strong. China, Indonesia, Singapore, and India offer interesting exceptions. Many programs accept the existing level of motivation and seek to meet the existing "need" by minimizing the cost of fertility control not only monetarily but personally, by legitimizing the idea and by providing services through trusted sources, clinics, or other outlets as accessible to the people as the available infrastructure and resources permit (Freedman and Berelson, 1976).

Program Organization

Official family planning programs have usually come under the aegis of ministries of health, using public funds, facilities, and health workers to deliver services. This arrangement provides a logical means for program organization and development. In many developing countries, however, the villages, where a large proportion

of the population resides, are beyond the effective reach of the modern health system. Furthermore, health systems frequently retain their clinical orientation and are weak on outreach. Consequently, in recent years, as the concepts of community health and primary health care have gained greater international recognition, and as shortcomings in clinic-based programs have become manifest, the trend has increased in developing countries to extend family planning services into the smaller rural communities and proliferating urban slum areas. Paramedical workers, nonmedical field-workers, promoters and motivators, household distributors, "barefoot doctors," and other local community-based agents and outreach mechanisms have all been employed in this effort.

In India the Health Ministry was renamed Health and Family Planning to reflect the importance and special character of population and family planning. In several cases a special independent Ministry of Population or Family Planning has been established to execute a national family planning program. In part because health ministries are typically weak among the various ministries competing for their share of scarce resources in the national budget, family planning has been placed under the jurisdiction of a national planning or other powerful ministry in some countries; for example, in Ghana family planning was placed under the Ministry of Finance and Economic Planning and in Mexico it was placed in the Ministry of the Interior. Whatever the organization in the government structure, major operational responsibility is usually given to the health ministry. In the Philippines the Commission on Population is located in the Office of the President and in Egypt family planning is in the Office of the Prime Minister. Because family planning programs embrace activities that are interrelated with those in a number of ministries, some countries have created an interministerial coordinating board or council at cabinet or subcabinet level to develop and carry out a family planning program; such an arrangement is the case in Indonesia.

In a number of relatively small countries and in some larger ones, governments have not been prepared to embrace family planning as national policy, or the health infrastructure has been too limited to mount an effective program. There family planning programs have been organized and executed by voluntary family planning associations, usually on a small scale, either acting on their own or with governmental backing and support. Family planning activities in some larger countries that now have national government programs were privately initiated. One common pattern has been for voluntary associations to establish family planning clinics at government health facilities using government health personnel, and sometimes with government financial back-

ing. The tendency is for governments to take over the operation of such clinics in due course, and for the voluntary association gradually to develop specialized supportive functions such as training, evaluation, conducting innovative demonstration projects, carrying out trials of contraceptive methods not previously used in the country, handling informational and motivational activities, and managing international grants. There is no uniform pattern, however, and the evolution of public sector, voluntary association, private medical, and commercial sector policy, services, and supportive activities unfolds a little differently in each country. In a number of Latin American countries the social security system has become a major provider of family planning services along with the health ministry and the family planning association.

Program Evolution

Modern, large-scale, government-sponsored national family planning programs started when India began to support family planning in 1951–1952. During that decade, governments in China, Taiwan, Hong Kong, Singapore, Barbados, and Tonga also initiated family planning activities, and Sri Lanka supported a private association effort. Family planning services had previously been available in Bermuda for some time. Nationwide government programs spread rapidly during the 1960s and subsequently. By the middle 1960s most of the countries of South and East Asia had established national programs, and by the end of the decade most Southeast Asian and most of the larger Latin American nations had done so. During the 1970s most of the island countries of Oceania and the Caribbean and most of the countries of the Middle East and Africa initiated family planning programs (see Table 1).

By the dawn of the 1980s a majority of developing countries with a very large majority of the world's population were supporting family planning, either through a government program or with the aid of a family planning association. Table 1 summarizes policies of 152 developing countries or territories with respect to family planning as of 1980; 117 countries were supporting family planning, including 37 of the 39 developing countries with populations over 10 million. Supporting countries had a combined population of more than 3.1 billion, 96 percent of the population of all developing countries. Burma was the only country with a population more than 20 million not supporting family planning; the only other nonsupporting country with a population over 10 million was North Korea. Other principal nonsupportive countries included Mongolia, Kampuchea, and Laos in East and Southeast Asia; Bolivia in Latin America; Saudi Arabia, several Middle Eastern oil states, Mauri-

TABLE 1. *Number and population of developing countries by governmental policy position and date[1] of initial governmental support of family planning, by region, 1980*

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
South Asia	5	2	0
Population (millions)	882.1	1.4	0
% Regional population	99.8%	0.2%	0

Demographic support: Bangladesh 1960, India 1951, Nepal 1965, Pakistan 1960, Sri Lanka 1953

Health & human rights support: Bhutan 1979, Maldives 1978

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
East Asia	4	0	3
Population (millions)	1035.8		19.9
% Regional population	98.1%		1.9%

Demographic support: China 1956, Hong Kong 1955, South Korea 1961, Taiwan 1959

Nonsupport: North Korea, Macao, Mongolia

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
Southeast Asia & Oceania	14	4	7
Population (millions)	311.1	3.3	44.4
% Regional population	86.7%	0.9%	12.4%

Demographic support: Indonesia 1967, Malaysia 1964, Philippines 1969, Singapore 1959, Thailand 1967, Vietnam 1962 (South Vietnam 1968), Cook Islands 1974, Fiji 1962, Kiribati 1970, New Hebrides 1972, Samoa 1970, Solomon Islands 1970, Tonga 1958, Tuvalu 1970

Health & human rights support: Papua New Guinea 1968, American Samoa 1973, Guam 1967, St. Helena 1975

Nonsupport: Brunei, Burma, Kampuchea (support 1971–77), Laos (support 1971–76), Nauru, Tahiti, Tokelau Island

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
Latin America and the Caribbean	15	22	6
Population (millions)	120.4	203.9	6.1
% Regional population	36.4%	61.7%	1.8%

Demographic support: Colombia 1967, Dominican Republic 1968, El Salvador 1968, Guatemala 1969, Mexico 1972, Puerto Rico 1967, Barbados 1955, Grenada 1974, Guadeloupe 1968, Jamaica 1966, Martinique c. 1976, St. Kitts–Nevis 1971, St. Lucia 1975, St. Vincent 1972, Trinidad & Tobago 1967

Health & human rights support: Brazil 1974, Chile 1962, Costa Rica 1967, Cuba early 1960s, Ecuador 1968, Haiti 1971, Honduras 1966, Nicaragua 1967, Panama 1969, Paraguay 1972, Peru 1976, Venezuela 1965, Anguilla 1979, Antigua 1973, Bermuda 1937, Cayman Islands 1977, Dominica 1970, Guyana 1977, Montserrat 1976, Netherlands Antilles 1965, Br. Virgin Islands 1979, U.S. Virgin Islands 1970

Nonsupport: Bolivia (support 1968–76), Bahamas, Belize, French Guiana, Suriname, Turks & Caicos

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
Middle East	5	11	10
Population (millions)	153.6	93.3	19.5
% Regional population	57.7%	35.0%	7.3%

Demographic support: Iran 1967, Turkey 1965, Egypt 1965, Morocco 1965, Tunisia 1964

Health & human rights support: Afghanistan 1970, Bahrain 1974, Iraq 1971, Jordan 1976, Lebanon 1970, Syria 1974, North Yemen 1975, South Yemen 1973, Algeria 1971, Somalia 1977, Sudan 1970

Nonsupport: Kuwait, Oman, Palestine (Gaza), Qatar, Saudi Arabia, United Arab Emirates, Djibouti, Libya, Mauritania, Albania
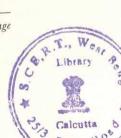
TABLE 1. *Number and population of developing countries by governmental policy position and date[1] of initial governmental support of family planning, by region, 1980 (continued)*

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
English-speaking sub-Saharan Africa	8	10	1
Population (millions)	45.0	176.9	6.1
% Regional population	19.7%	77.6%	2.7%

Demographic support: Botswana 1970, Ghana 1968, Kenya 1966, Lesotho 1974, Mauritius 1964, Seychelles 1975, Swaziland 1971, Uganda 1971

Health & human rights support: Ethiopia 1972, Gambia 1968, Liberia 1973, Namibia 1972, Nigeria 1970, Sierra Leone 1976, South Africa 1966, Tanzania 1970, Zambia 1974, Zimbabwe 1968

Nonsupport: Malawi

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
French- & Portuguese-speaking sub-Saharan Africa	1	16	8
Population (millions)	5.7	90.1	32.2
% Regional population	4.5%	70.4%	25.2%

Demographic support: Senegal 1976

Health & human rights support: Benin 1969, Burundi 1979, Cameroon 1975, Cape Verde 1978, Central African Republic 1978, Comoros 1979, Congo 1976, Guinea-Bissau 1976, Madagascar 1976, Mali 1971, Mozambique 1977, Niger 1977, Réunion 1966, Rwanda 1977, Togo 1974, Zaire 1972

Nonsupport: Angola, Chad, Equatorial Guinea (Spanish-speaking), Gabon, Guinea, Ivory Coast, São Tomé & Príncipe, Upper Volta

Region	Support: demographic rationale[2]	Support: health & human rights rationale[3]	Nonsupport[4]
Developing world total			
Countries	52	65	35
Population (millions)	2553.7	569.0	128.2
% Regional population	78.6%	17.5%	3.9%

[1] Earliest date with reasonable evidence of *governmental* commitment to family planning (e.g., by formal programmatic effort, by initial *governmental* budgetary or facilities support of family planning association, or by *governmental* agreement with or submission of request to UNFPA for family planning support.)
[2] Countries supporting family planning to reduce threat of rapid population growth to development or for related demographic reasons usually also support it for health and human rights.
[3] Some countries supporting family planning for health and human rights reasons recognize that a program may have demographic consequences and, thus, affect development.
[4] Position of some countries unclear; several seem to be moving toward support.

tania, and Albania in the Middle East and North Africa; Malawi in English-speaking sub-Saharan Africa; and a few countries in French- and Portuguese-speaking sub-Saharan Africa, where support has grown most slowly (see Table 1). Kampuchea, Laos, and Bolivia had family planning programs in the early 1970s but suspended them and adopted pronatalist policies in the mid-1970s; in the former two instances the action was taken by new governments following civil war. Otherwise support for family planning has become increasingly widespread in developing countries. In addition, most developed countries have strengthened their delivery of family planning services, and many provide technical and financial assistance to developing countries to do likewise. Active support is also being provided through the United Nations system by the United Nations Fund for Population Activities (UNFPA), the World Bank, the World Health

Organization (WHO), the Pan American Health Organization (PAHO), and other members of the United Nations family of agencies, including UNICEF, UNESCO, the United Nations Development Programme (UNDP), the Food and Agricultural Organization of the United Nations (FAO), and the International Labour Organisation (ILO).

Program Rationale

In all of the larger countries and most of the smaller countries of South, East, and Southeast Asia, the primary rationale for governmental initiative in family planning was demographic (see Table 1). That is, there was concern that the rapid rate of population growth was outstripping economic and social development. In some countries there was also concern with large absolute pop-

ulation size or with high population density relative to arable land or accessible resources. In some instances it was felt that the country could support a larger population, but that growth should be attained more gradually. In most instances it was perceived that rapid population growth would act as a constraint upon economic and social development. Family planning was seen as a means of releasing this braking effect of excessively rapid growth upon development, and of easing the pressure of growth upon an underdeveloped and struggling economy and a fragile network of social institutions already beset by the formidable challenges of modernization.

This general rationale prevailed in most of the countries of South, East, and Southeast Asia that established national family planning programs, except initially in South Vietnam and Hong Kong and in Papua New Guinea, Kampuchea, and several islands, where programs had instead a rationale of health or human rights or both. Through a series of resolutions and conference documents the United Nations played a leading role in articulating and popularizing the human rights rationale; the "women's movement" in the United States and several other countries and the drive for female labor productivity in the communist countries have also contributed. Family planning now has the status of a constitutional right in China, Mexico, Ecuador, Yugoslavia, Portugal, and Guanabara State in Brazil. The relatively high risks to mothers, infants, and, to some extent, to older siblings—which are found to be associated with high birth order, births at either very young or advanced maternal age, closely spaced births, and large family size—underlie the health rationale (see Watson et al., 1979).

Family planning was also supported on grounds of maternal and child health and human rights in most of the Asian countries where it was supported for demographic reasons, but it was the perception of rapid population growth as a threat to public welfare that principally underlay vigorous governmental intervention and international assistance efforts to develop strong family planning programs.

Program rationale in many countries of Latin America, the Middle East, and Africa has been different from that in South and East Asia. In general, populations in these regions are smaller and less dense then in the Orient. Religions, cultures, and social structures differ. With some important exceptions, family planning policies and programs have developed more slowly outside South and East Asia. Programs elsewhere were often initiated for health reasons and much less frequently for demographic reasons. In some instances, programs were originally established to serve health or human rights objectives, and demographic objectives then became relevant or were

articulated later as in Mexico, El Salvador, and Hong Kong. In a few instances, countries with pronatalist views have supported family planning because of its maternal and child health benefits.

As a rule, countries that base family planning on health have been slower to develop their programs, have shown less administrative and budgetary commitment to family planning, have been less likely to develop strong and effective programs, and have placed less emphasis on motivating the population to use family planning. The distinction between the health and human rights rationale for family planning and the demographic rationale underlay some of the controversy and compromises at the World Population Conference at Bucharest in 1974, and it has played a role in the changing policies and politics of many of the national and international agencies that assist family planning in developing countries.

Overall in the developing world in 1980, fifty-two countries with a population of 2.5 billion (79 percent of the developing world's population) were providing support to family planning for demographic reasons. An additional sixty-five countries with a population of more than 500 million (17 percent of the developing world) were supporting family planning for health or human rights reasons. The remaining thirty-five developing countries with 4 percent of the developing world's population were not supporting family planning by that date, although several seemed to be preparing to do so (see Table 1).

Program Approaches

The principal means of fertility control used in family planning programs are oral contraceptives, intrauterine devices (IUD's), condoms, male sterilization, female sterilization, and, in some instances, abortion. Although widely practiced with substantial demographic impact in some countries, coitus interruptus (withdrawal), postpartum abstinence (or living apart), and prolonged breastfeeding are not normally part of the program. Rhythm (periodic abstinence) and foam tablets are used in some programs (the former particularly in Roman Catholic countries) but the number of users of these methods is small in most countries. Increasingly in Thailand, Mexico, and several other countries injection of Depo-Provera is being adopted as an attractive option despite uncertainty about possible long-term side effects.

Family planning programs use a variety of approaches to deliver these methods and related information and services. They can (1) include all or only a few of the major means of fertility control, (2) give more or less attention to "creating demand," typically through informational efforts, in addition to facilitating the provision

of contraceptive supplies, or (3) encourage or neglect supplementary efforts through private medical and commercial channels and social marketing schemes. They can also (4) provide or avoid special inducements in the form of incentives and disincentives, monetary or in-kind, including free or subsidized supplies and services, (5) be unipurpose or be multipurpose programs, "integrated" with other health or social service and economic development programs, (6) be administered via one or more of a variety of delivery systems including fixed or mobile clinics, postpartum programs, full-time or part-time field-workers, local community agents, "barefoot doctors," household distribution, private physicians, sterilization camps, special drives, and incorporation into broader systems of maternal and child health. Finally they can (7) cover, or intend to cover, the whole of a country, as in a national family planning program, only the urban centers where the medical infrastructure is more nearly adequate, or only a limited subarea, as in a pilot project.

Most programs emphasize providing contraceptive supplies and information more than increasing the extent of latent demand for contraceptives. Typical rationales for this emphasis are (1) that demand is more or less "given" at a particular time in a particular country, (2) that legitimizing family planning will make latent demand manifest, (3) that the most realistic way to extend motivation is to service and satisfy existing motivation, and (4) that motivation can be addressed through symbolic appeals ("education") rather than having to await basic, long-term social and economic changes in the society. Other typical rationales include (5) that motivation will build with the process of historical modernization, and minimizing supply problems will significantly facilitate the total process, and (6) that motivation will be greater among the next reproductive generation, which is part of a society that accepts contraception and family planning, than among the older generation, which belongs to a society where conditions are quite different (Freedman and Berelson, 1976).

A few countries (e.g., China, Indonesia, and Singapore) have gone beyond improving access to contraception and have made strong and apparently successful efforts to increase popular demand for family planning. Major fertility declines have taken place in China and Indonesia, and in 1975 Singapore became the first developing country to achieve "replacement-level fertility" after having carried out a strong family planning program and initiating a series of social and economic disincentive measures designed to discourage the bearing of large families. Strong national and state governmental pressure to increase the use of sterilization was exerted in India in 1976, and sterilizations increased dramatically; this pressure, however, helped cause the fall of the government in 1977, after which sterilizations declined sharply. A number of countries have had "Stop at Two" or "Stop at Three" or other intensive mass media campaigns (as in Isfahan, Iran, and Kaoshiung, Taiwan) and recently the Chinese have adapted this approach to "One Family, One Child." Telephone "hot line" information service experiments have been conducted in Manila, Seoul, Singapore, and Taipei.

Delivery of Services. Delivery of family planning services is accomplished through various kinds of agencies, agents, and programs: fixed and mobile clinics, postpartum programs, private physicians, field-workers, community agents, household distribution, sterilization camps, and special drives.

Clinics. Insertion of IUD's, male and female sterilization, and injection of contraceptives are usually considered medical procedures. So are abortion and menstrual regulation. These methods all have medical side effects and contraindications, as do oral contraceptives. Of the major methods offered by family planning programs noted previously, only condoms are completely nonmedical. Furthermore, family planning is typically viewed as a health service. Thus, many family planning programs have been clinic-based and have involved the services of physicians. Clinics may be located in general public or private hospitals, maternity hospitals, health centers, maternity centers, independent facilities, or in the small clinics of private physicians. Services may be performed by physicians or, increasingly, by nurses or paramedical personnel under the supervision of physicians. The clinical setting offers advantages of expertise, laboratory facilities, and back-up in the event of complications. This setting is familiar and comfortable for medical personnel. However, it may not be familiar or comfortable for many clients or patients in developing countries, who have had little or no contact with hospitals, doctors, expensive laboratories, and modern medicine. Confronting the modern medical system for the first time may be a traumatic experience. In any event, for large proportions of the village population in many developing countries it is virtually impossible because the facilities and personnel are almost completely inaccessible geographically as well as economically and culturally. Hence, there has been increasing concern with alternative approaches.

Mobile units. An alternative that has been used successfully in a number of instances is to take the clinic to the people. Buses, vans, and trailers of various kinds have been remodeled into small mobile clinics and driven into rural areas that are unserved or underserved by fixed health facilities. Floating clinics (boats) have been used in a few instances. Mobile units have represented an imaginative but usually modest extension of the clinical system in some countries and have made clinical family

planning facilities somewhat more accessible to the "target" population. The approach is expensive, however, and the necessary medically skilled staff are frequently not available. Topographic, transportational, maintenance, and budget constraints severely limit the range of the vans in some instances. Medical follow-up and continuity of care are more difficult to arrange than with fixed clinics. An interesting application of mobile-clinic programs has been in low-income urban areas where the quantity and quality of fixed-clinic facilities have frequently been inadequate.

Postpartum programs. Postpartum family planning constitutes a useful supplementary approach to traditional clinical services. Women who have just given birth or had an abortion are likely to be interested in family limitation and child spacing services. Such women have proven fecundity. In countries where the birth rate is high, a large proportion of fecund women of reproductive age will pass through a postpartum period within a few years. Many of these women in developing countries have almost no contact with the modern medical system except at delivery and for several days immediately thereafter; thus, the period of accessibility to clinical and educational services is critical. The Population Council carried out a major international postpartum program in the 1960s and 1970s, and many of the world's largest hospitals and an increasing proportion of smaller ones now offer postpartum family planning featuring education and motivational services, IUD insertion, female sterilization, and, in a few instances, contraceptive injections and other methods (Zatuchni, 1970). Postabortal IUD insertion was pioneered in Santiago, Chile, and has now been added to the service options in several countries. It should be noted that there is some overlap between contraceptive protection acquired in a postpartum program and natural postpartum lactation-amenorrhea (if the infant survives and is breastfed) and with postpartum abstinence or separation of spouses, both of which are common practices with antinatalist effects in some cultures. Even the best postpartum programs have difficulty in reaching remote rural populations where births take place in homes rather than in the institutional facilities of hospitals, clinics, and maternity centers.

Private physicians. Private doctors are involved in family planning in most countries of the world, including those where no organized family planning program exists. They constitute an important channel for services even if the governmental program is the dominant provider. In countries such as the United States, where most of general medical care is delivered through the private sector, private doctors probably play a leading role in providing family planning services, except to the more economically disadvantaged segments of the population,

for whom a complex network of public and nonprofit agency services has developed. In South Korea and Taiwan private physicians, who are accessible to a large proportion of the population in those countries, have been involved in the government program; they provide most of the sterilizations and IUD insertions on a government fee-for-service basis. The SOMEFA project in Colombia was successful in increasing the participation of private practitioners in the provision of family planning services by making contraceptive supplies and new equipment conveniently available to them. In most developing countries, however, private physicians are in short supply and are heavily concentrated in the larger cities, quite inaccessible to large segments of the rural population, and sometimes to economically disadvantaged urban groups.

Field-workers. Field-workers (promoters or motivators) are an important source of information and education in many family planning programs. As personal agents they are likely to be better trusted than mass media information and appeals and more flexible in responding to specific questions of potential clients. Field-workers, who may or may not be midwives or other traditional birth attendants, are normally given special, short-term training in family planning, contraceptive methods, community education, and client recruitment. Where program organization, administration, supervision, and transportation permit, field-workers can carry information about family planning beyond the normal areas served by hospitals or clinics, into the smaller towns, villages, and neighborhoods where large numbers of potential clients reside. There they conduct group meetings and home visits as in the Taichung experiment in Taiwan, the Koyang-Kimpo and Sungdong Gu experiments in Korea, and the national programs in both countries. In some programs, field-workers also distribute contraceptive supplies such as condoms and foam tablets to those interested. In a growing number of programs, field-workers have provided resupply of pills after initial acceptance at a clinic. Increasingly they make initial "prescription" of oral contraceptives, for new acceptors, who then may or may not be referred to a doctor or clinic for a more thorough screening examination. This approach was tested in the Thai Auxiliary Midwife Project and subsequently expanded into a successful nationwide program. Oral contraceptives have side effects, as do other medications, but in most developing countries maternity-related risks are substantially greater, and in many the attractiveness and accessibility of alternative contraceptive methods are severely limited, so that a strong public health argument can be marshaled in support of this method. Field-workers have played a key role in a number of successful family planning programs; without

them information on the existence of the program, reasons for it, contraceptive methods, and sources of further information, supplies, and services are less likely to reach their audience. Field-workers constitute an expanding channel for providing contraceptive supplies as noted.

Community agents. Field-workers extend the effective reach of a clinical system and make certain kinds of services more accessible to the population. But to blanket a country with sufficient field-workers to make family planning information and services accessible almost universally is expensive in countries where family planning has low budgetary priority relative to other development needs. Budgetary restrictions on personnel and transportation frequently limit the universality of coverage. Furthermore, field-workers represent the large center reaching out rather than the local community helping itself from its own resources or controlling its own services. However, in the early 1960s a "Community Organizer" experiment was conducted in Comilla, Bangladesh. Subsequently, in experimental projects in many countries and larger-scale programs in a few, most notably perhaps in the case of the Chinese "barefoot doctors," the rural and urban Profamilia programs in Colombia, and the Mothers' Clubs in Korea, traditional birth attendants or lay personnel, selected by and from the local village, have been given special short-term training to become local, community-based agents for the distribution of oral contraceptives, condoms, and foams. Through this mechanism, contraceptive information and supplies can be made more nearly universally available through trusted sources at the local village level. The technical expertise of a typical community agent is less than that of a typical field-worker, but geographic and social accessibility to the local population and local community control are greater. Usually community agents work on a part-time or voluntary basis. Thus, community-based distribution program costs are low, relative to the potentially broad coverage made possible. Although maintaining the interest and enthusiasm of the workers on a long-term basis with only a limited or no monetary incentive has proven difficult in some instances, such programs appear to have increased the use of contraception considerably in a number of projects, and family planning and other preventive health care in China seem to have been improved dramatically by the paraprofessional "barefoot doctors."

In an effort to increase the availability of contraceptives to the populace at the community level "social marketing" programs have been organized in several countries. In such programs government subsidies allow the local shopkeeper or other distributor to make a small profit while keeping the retail price low to the consumer. Condoms, in particular, have been distributed through

such means: the Kinga Project in Kenya, the Preethi Project in Sri Lanka, and Nirodh distribution in India are examples. [*See* FAMILY PLANNING PROGRAMS, *article on* NONCLINICAL PROGRAMS.]

Household distribution. A further possible step in making contraceptive supplies universally accessible is household distribution or "saturation" of the community. In Euiryong and Cheju, Korea, in Taiwan, in a Cholera Research Laboratory experiment in rural Bangladesh, and in other areas, experimental projects have been undertaken in recent years in which a field-worker or community agent visits every household and leaves a supply of contraceptives, typically pills or condoms or both, wherever they are not refused. Distribution may be continued on this basis for several months and then revert to the channel of a community agent or a home depot. Willingness to receive contraceptive supplies in a house-to-house campaign does not necessarily guarantee use, of course, or even interest, and has implications in terms of people's commitment to contraception different from acceptance in the normal sense. Such distribution may have an immediate and perhaps a longer-term educational effect beyond its short-term impact on contraceptive use. Evidence on the effectiveness of household distribution is only beginning to accumulate, but several experiments appear promising. [*For further detail on household distribution projects, see* FAMILY PLANNING PROGRAMS, *article on* NONCLINICAL PROGRAMS, *which also includes discussion of commercial and social marketing distribution.*]

Sterilization camps. In the late 1960s India began to experiment with sterilization camps. Rather than sustaining modest effort over a lengthy period, which has proven difficult in India and other large countries of South Asia and in a number of rural areas throughout much of the developing world, the camp concept involves a maximum effort for a short period of a few days or weeks and seeks total community involvement. Medical personnel, equipment, and facilities are assembled. Mass media appeals are employed. Support from the local community leadership is mobilized, and an effort is made to create a carnival-type atmosphere with a "band wagon" effect. Psychological support is provided for those who accept contraception. Monetary and in-kind incentives, substantial in some instances, are frequently used. Following spectacular successes in three different projects in Ernakulam and in a statewide effort in Gujarat, crash programs of this type were initiated in many localities in India, frequently with dramatic effect in terms of incidence of sterilization, but not much elsewhere. Fertility effects, which may be substantial, depend heavily upon the age distribution and previous contraceptive practice of the acceptors. To the extent that ac-

ceptors, male or female, are beyond or nearing the end of reproductive age, already sterile, or already practicing contraception effectively, the fertility effect is minimized. Providing satisfactory aftercare and sustaining a program for a longer time have proven to be troublesome problems.

Special drives. Special drives during Family Planning Month or at some other appropriate time have been used in family planning programs in Indonesia and a few other countries. These have been less intense than the Indian sterilization camps, with less geographic concentration of resources, but of broad geographic scope in some instances. Typically they have offered a greater selection of contraceptive methods. Support from community political leadership has been important in Indonesia, as in India and China, but such support has not been limited to the highly successful special drives. Greater intensity of effort to reach annual acceptor targets during certain seasons has been a notable feature of the family planning program in South Korea. Program continuity may be a problem with this approach, and in Indonesia those who have accepted contraceptives through a special drive have not continued contraceptive use as long as those who have accepted them through a regular program.

Special-purpose (Vertical) versus Integrated Programs. Successful family planning programs in South Korea, Taiwan, Indonesia, and several other countries have been, for the most part, special-purpose or uni-purpose (or, as they are often called, "vertical") programs addressed to family planning without offering additional health or development services. Correlatively, most other health and development programs have not provided family planning services, although a few have provided limited information. Thus, family planning programs have been parallel to programs to eradicate or control smallpox, malaria, yaws, and several other diseases. However, the view that family planning is or should be linked to other critically needed health services, especially maternal and child health services, has been put forward strongly by WHO and has been gaining ascendancy in recent years (see Watson et al., 1979). This viewpoint is prevalent in Latin America and especially in Africa, where it is frequently argued that governments and people are unlikely to respond favorably to family planning unless it is provided in a context of maternal and child health. Chinese "barefoot doctors" provide family planning among other health services. The Population Council organized the so-called Taylor-Berelson Program, initiated by Howard C. Taylor, Jr., and Bernard Berelson, as an international research and demonstration program in the integrated delivery of

family planning and maternal and child health services in Indonesia, Nigeria, the Philippines, and Turkey (Atkins, 1980). Other major integrated projects have included experiments in Narangwal and Gandhigram, India; Danfa, Ghana; Etimesgut, Turkey; and the DEIDS project in Thailand.

Some countries are attempting to integrate family planning components into maternal and child health or other health and development programs, or, conversely, to integrate other health and development components into successful family planning programs. Especially since the 1974 World Population Conference in Bucharest, several of the international funding agencies for population matters have given higher priority to integrated programs. The political appeal of such programs seems to have been established. Their ultimate popular appeal is less clear and probably varies considerably among and within countries. Whether these appeals outweigh the greater organizational complexities, demands for retraining, and managerial expertise required by integrated programs remains to be seen. This issue may continue to be controversial in the years ahead, under budgetary pressures and as family planning programs continue to evolve from centralized and clinic-based programs toward greater community control, and additional types of literate and illiterate community-based workers become involved in the delivery of information, supplies, and services (Watson et al., 1979).

Abortion. Abortion is a means of fertility control rather than an approach to the delivery of services. However, its demographic importance, controversiality, and use in programs in a few major countries dictate its discussion as a special approach. Because the topic is treated in detail elsewhere in this work [*see* ABORTION, *article on* INDUCED ABORTION], it is considered only briefly here.

Since the end of World War II there has been a trend toward more liberal abortion laws in many developed countries and a few developing countries. [*See* LAW AND FERTILITY REGULATION, *article on* WORLDWIDE PERSPECTIVES.] Despite this trend and despite strong demand for abortion in many parts of the world, as attested by the widespread incidence of illegal (and frequently unsafe) abortion, abortion services have not been so extensively developed within the context of family planning programs as one might suppose. This is true even in many of the countries whose programs aim at reducing the rate of population growth as a contribution to socioeconomic development. The absence of back-up abortion services has undoubtedly played an important role in limiting the maximum demographic impact of some family planning programs (Mauldin, 1975).

In a few countries, however, there are notable policy

connections between abortion and family planning programs. Abortion is an officially accepted, though not usually preferred, family planning method in China, Singapore, and Tunisia; it is accepted to a lesser but increasing extent in India and probably in Vietnam. This is true on a *de facto* basis in Cuba and also in South Korea, where the Planned Parenthood Federation of Korea has played a role in improving the quality of abortion services. Because of the dominance of China and India, these seven countries, where abortion is a part of the family planning program, have more than half (54 percent) of the developing world's population. In Peru, on the other hand, abortion is expressly prohibited as a means of birth control, and unofficially this may well be true in other countries, such as the Philippines. The development of family planning programs in the 1960s in a number of Latin American countries was greatly stimulated by the desire to reduce the severe health hazard posed by the widespread practice of illegal abortion. In some instances there was also felt to be a religio-ethical advantage in controlling illegal abortion by means of contraception.

In addition to the seven countries noted above, Fiji, Hong Kong, and Zambia have relatively liberal abortion policies. North Korea has one also but has no family planning program. Menstrual regulation services have been initiated on a small scale or pilot basis in several countries, including Bangladesh and Indonesia despite their restrictive abortion laws.

Program Performance

Because of national differences in definitions and reporting of family planning service statistics, caution is required in using them comparatively. Two special problems concern (1) ambiguities between acceptors, who at some point initiate use of a method but may or may not be continuing to use it at some later time, and users, who are definitely using the method at some reference period, of such methods as oral contraceptives and condoms, which require repeat supplies, and (2) whether government and family planning association programs are reported separately or jointly. Apart from definitional and reporting problems, acceptance rates measure a combination of the vigor of program implementation on the one hand, and the responsiveness of the population on the other, and are not a measure of either alone. The latest available data (Nortman and Hofstatter, 1980) are subject to these limitations but make possible rough comparison of program performance in 1976 among thirty countries. In that year program acceptance rates (acceptors as a proportion of married women aged 15–44) varied from less than 1 percent to more than 20 percent. The median acceptance rate for four Middle Eastern programs was 3 percent, for four African programs 3.5 percent, for ten Latin American programs 5.5 percent, and for twelve programs in South, East, and Southeast Asia 11.5 percent. These figures give a rough indication of the range of governmental and popular commitment to family planning at that time. The trend of acceptance rates was more or less rising in twenty countries, roughly stable in seven countries, and generally downward in three. [*See* CONTRACEPTIVE USE; *article on* DEVELOPING COUNTRIES.]

Characteristics of Program Acceptors. Service statistics from a number of programs indicate that there is considerable variation between and within countries in the age, number of living children, and other characteristics of those who accept family planning. Relatively few acceptors are of extremely low or extremely high age and parity. There has been a fairly universal downward trend in the age and parity of acceptors; that is, over a period of a few years the new acceptors in programs have become progressively younger and have had fewer children at initial acceptance. Acceptors of oral contraceptives are typically younger than IUD acceptors, who in turn are younger than sterilization acceptors; sterilization, of course, is seen as a terminal method after family size has been completed, whereas oral contraceptives are used to some extent, varying among countries, as a temporary and child-spacing method. Thus, average continuation or duration of use of contraception has been longer with sterilization than with the IUD, and longer with the latter than with oral contraceptives. Continuation has typically been longer in early periods of careful clinical testing than in large-scale field programs. Discontinuation has proven to be a troublesome problem in a number of programs. [*See* CONTRACEPTIVE USE, *article on* DEVELOPING COUNTRIES.]

Fertility Effects. Since many programs have been designed to reduce fertility, and since others designed to improve health have recognized lower fertility as a likely side effect, there has been a great deal of interest in and research addressed to measuring the effect on fertility of family planning programs. Although a number of other criteria might well be employed, to a considerable extent programs have been judged effective if they seemed to be depressing national fertility, and ineffective otherwise.

Facile judgments have been common, but assessing program effects on national fertility thoroughly and quantitatively has proven to be extraordinarily difficult. The problem has had such troublesome aspects as measuring fertility accurately in the absence of reliable vital statistics, disentangling program effects from the effects of contraception and abortion used in the private sector, attempting to assess what fertility the clients of a program might have had if they had not accepted family planning, and the extent to which declining fertility is

attributable to a family planning program or to other social and economic trends in the country or to joint effects of both. [*See* FAMILY PLANNING PROGRAMS, *article on* EFFECTS ON FERTILITY.]

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Further discussion of family planning programs can be found in country articles and in ASIA *and* LATIN AMERICA. *See also* ABORTION, *article on* INDUCED ABORTION; CONTRACEPTIVE USE, *article on* DEVELOPING COUNTRIES; EDUCATION, *articles on* POPULATION EDUCATION *and* SEX EDUCATION. *For descriptions of the methods used in family planning programs, see* ABORTION, *article on* MEDICAL TECHNIQUES; CONTRACEPTIVE METHODS; STERILIZATION TECHNIQUES. *For discussion of the legal framework for family planning programs, see* LAW AND FERTILITY REGULATION, *article on* WORLDWIDE PERSPECTIVES. *See also* ETHICS. *For discussion of support for family planning programs, see* INTERNATIONAL POPULATION ASSISTANCE.

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2.
NONCLINICAL PROGRAMS

Nonclinical contraceptive distribution programs involve organizational arrangements for delivering contraceptive services outside the medical and clinical systems. Such programs are intended to make modern contraceptives widely available to populations whose access to modern family planning methods would otherwise be severely restricted because of shortages of medical personnel and facilities. Nonclinical programs have been variously referred to as "community-based distribution (CBD) projects," "village or alternative delivery systems," "inundation or household distribution programs," "non-physician distribution of contraceptives," "subsidized commercial programs," and "social marketing programs."

Most nonclinical programs share the following features. Contraceptives are limited to such materials as oral contraceptives, condoms, and spermicides. Women with contraindications to and side effects from oral contraceptives are referred for medical consultation. Many programs also make referrals for insertions of intrauterine devices (IUD's), sterilizations, and other medical procedures. Since the methods used require renewal of supplies, distributors of contraceptives, often lay villagers, are an important aspect of the programs. Distributors are briefly trained from a few hours to a week or more, and distribution points are located in areas that are unserved

by clinics, such as rural villages and urban squatter settlements.

Types and Characteristics. Two general types of nonclinical programs exist: the community-based project and the subsidized commercial project. Community-based projects establish paid or volunteer networks of distributors, who are drawn from the ranks of minor officials and community leaders, satisfied contraceptive users, and traditional health care practitioners. Contraceptives are offered free of charge or at a nominal sum. Distribution points may be established in private homes, shops, health stations, or government buildings such as post offices and police stations. Distributors are often augmented by educational field-workers and media campaigns designed to promote the concept of family planning and to inform potential clients about the program. In community-based programs, medical histories are dispensed with and record keeping at most is limited to clients' names and addresses, a supply record, and a few demographic characteristics such as the acceptor's age and number of living children.

Household distribution, or inundation, programs comprise a distinct subcategory of community-based distribution. These projects strive to make contraception maximally available by offering supplies to potential acceptors in the home. Household distribution projects are usually launched with a canvass of all dwellings in an area. All eligible women encountered during the canvass are offered contraceptives. Often two or three canvasses will be made in an area, but eventually new clients and women seeking renewed supplies are directed to local distribution posts, and the program thereafter operates as a conventional community-based program.

In 1978, fifty-six community-based programs were in operation. They ranged in scale from small demonstration and experimental projects to programs of national scale enrolling hundreds of thousands of acceptors, as in Brazil, Colombia, Indonesia, and Thailand. Community-based projects have been sponsored by both private family planning organizations and national and provincial governments.

Subsidized commercial or social marketing projects capitalize on the fact that in most developing nations the network of shops selling consumer products extends into the most remote regions. The contraceptives are supplied by governments or international donor agencies and are sold at a subsidized price, to make them affordable by couples with very limited incomes. The contraceptives are marketed in the same way as consumer disposable products such as soap, toothpaste, tobacco, and candy. They are packaged, priced, and advertised according to the findings of market research firms, and distributed by wholesalers of consumer products to retailers of all types.

Evaluation of commercial projects is accomplished through analysis of inventory reports, sales records, and marketing surveys.

In early 1978, at least twenty-seven commercial projects existed. Major programs were found in Bangladesh, India, Jamaica, Sri Lanka, and Thailand. Variations on the basic, subsidized, commercial marketing model include mail order sales in Indonesia and condom vending machine sales in several nations of Latin America and the Caribbean.

History. The great majority of community-based and subsidized commercial contraceptive programs were initiated in the mid-1970s. The concept, however, is virtually as old as the international family planning movement. Between 1962 and 1968 the Pakistan Academy for Rural Development sponsored a project in Comilla Thana, East Pakistan (now Bangladesh), which used village representatives to distribute condoms and foam tablets. The reasoning behind this project is essentially the same as that of all subsequent CBD programs. "It has been observed in Pakistan and elsewhere that due to a shortage of trained personnel, most programmes get stalled before they reach the people. The staff of the Academy believes that a programme without roots in the villages themselves . . . is unlikely to be successful. Hence the rationale, and particularly for family planning . . . , is to build the innovation into the village through its own leaders, not via outside agents" (Khan, 1964, p. 9).

The Comilla project was relatively small, covering a population of about 6,600 in twenty-two villages. In contrast, the earliest subsidized commercial project, Nirodh, which began in India in 1968, was national in scope and eventually distributed more than 98 million condoms per year.

Prior to 1967, the more effective family planning methods then in use, such as the IUD and sterilization, were limited to distribution through clinics and physicians. The advent of the pill enabled community-based and subsidized commercial projects to distribute an attractive method of high theoretical effectiveness. One of the earliest programs to take advantage of this innovation was the Korean Mothers' Club project. Between 1968 and 1973 more than 28,000 clubs with more than 70,000 members were organized in South Korea's rural villages. Led by local women, the clubs recruited acceptors of the newly introduced pill (as well as of the more traditional condom), encouraged family planning acceptance and continuation by giving social support to users, and encouraged the participation of women in community development. The Mothers' Clubs also served as a major conduit for family planning literature in Korea. Eventually, in some clubs the activities not

concerned with family planning encompassed cooperative agricultural and construction projects and a variety of income-producing activities.

As of 1978, eighty-three community-based and subsidized commercial projects were identified and summarized (Foreit et al., 1978). Since that time existing projects have been continued or expanded and new projects and design variations introduced. Thirty-four projects were in Asia, thirty-nine in Latin America, and only ten in Africa.

Effectiveness of Projects. A variety of measures of project effectiveness are used in nonclinical programs. The discussion of measures in this article is based on the analyses of data from CBD programs by James R. Foreit and others (1978).

Acceptance rates. Data about acceptors are the most easily available and most commonly used indicators of intermediate effectiveness. Despite their limitations, useful comparisons and generalizations are possible about acceptance rates and acceptor characteristics. Limiting discussion to only those individuals who both accept and use contraceptives, data from intensive, fairly small-scale, experimental household distribution projects give acceptance rates ranging from 11 to 44 percent. In comparison, the acceptance rates from other types of demonstration projects (mainly those using IUD's) have been reported at between 6 and 20 percent, with most in the 15–20 percent bracket. Large-scale projects such as Preethi, Nirodh, the Profamilia projects in Colombia and the Sociedade Civil Bem-Estar Familiar do Brasil (BEM-FAM) in Brazil have cumulative acceptance rates ranging from about 2 percent in the Nirodh project to over 21 percent in Colombia and 32 percent in Rio Grande do Norte, Brazil. These results have been achieved with about three to five years of effort.

Available evidence further suggests that CBD projects reach relatively young, low-parity couples. In Rio Grande do Norte, 52 percent of acceptors were below age 30, 49 percent had 0–2 living children, and 33 percent were both below age 30 and had 0–2 living children. Seventy-five percent of the clients in the Indonesian mail order program are under 30 and have three or fewer children. In Sri Lanka it is estimated that 56 percent of women protected by Preethi (condom) are less than 30 and that 65 percent have three or fewer children. In Kenya and India acceptors of CBD condoms were found to be younger than couples using clinically obtained contraceptive methods or sterilization.

Continuation. The continuation rate is the proportion of acceptors who continue use of a contraceptive method to a given duration after acceptance. Life table techniques are employed in the calculation, with continuation analogous to survival. Short continuation may

imply unsuitable family planning methods or program procedures and large numbers of accidental pregnancies. Conversely, high continuation rates may imply high satisfaction and use effectiveness or strong motivation to regulate fertility.

Twelve-month pill continuation rates are available for six community-based distribution programs (see Table 1). They range from a low of 33 percent to a high of 75 percent with four of the rates clustering between 33 and 52 percent. These are comparable to the twelve-month continuation rates of 35 to 76 percent reported by John A. Ross and others (1972) for oral contraceptive acceptors in clinical programs and to the average rate of 55 percent reported for presumably highly motivated women enrolled in the international postpartum program.

Prevalence. The prevalence of contraceptive use is the proportion of the eligible population using contraception at a given time. Prevalence, in effect, suggests the net result of acceptance and continuation rates in the past. This combination presents a more pragmatic picture of the program's effect than does either measure alone.

When calculating increases of prevalence, it is possible to use either the relative increase in the percentage using contraception or the absolute percent increase (the additional proportion of the population recruited). (See Table 2.) Small-scale household distribution projects report absolute increases in prevalence of about 7 to 15 percent achieved in one year or less, while changes in control areas have been less than 2 percent.

Large-scale programs tend to report "current users" rather than prevalence. This figure expresses the number of current users among program acceptors as a proportion of the target population. It is not, however, a true

TABLE 1. *Twelve-month continuation rates for community-based distribution programs*

Country or project	12-month continuation rate
Bangladesh (urban)	71% (orals)
Brazil (Rio Grande do Norte)	52% (orals) (med. est.)
Colombia (rural)	75.2% (orals) (med. est.)
India (Allahabad)	40% (orals)
	82% (condoms)
Taiwan (postpartum)	32.9% (orals)
	42.4% (condoms)
Taiwan (all women)	36.4% (orals)
	57.1% (condoms)

SOURCE: Foreit et al., 1978, table 2; adapted by permission.

TABLE 2. *Prevalence data from household distribution and other demonstration projects*

Country or project	Prevalence of contraceptive use		Prevalence of contraceptive use	
	Before	After	Absolute increase	Relative increase
Bangladesh (Matlab-household)	1.1	15	13.9	1263.6[a]
Egypt (household)	18.4	30.9	12.5	67.9
Kenya (Kinga—commercial condom distribution)	21	35	14	66.7
South Korea (household)	31.0–38.0	38.0–45.0[b]	8–6	23–16

[a] Absolute increase in control area, 0.7%; relative increase, 24%.   [b] By different categories of women.
SOURCE: Foreit et al., 1978, table 3; adapted by permission.

prevalence rate because it does not take into account contraceptive use outside a program.

A few true prevalence figures for current users are available in large-scale programs, as, for example, in Dacca, Bangladesh, where the household distribution project claimed 11 percent of some 70,000 eligible females as current (program) users after one year. In Sri Lanka, it is estimated that Preethi condoms were used by 8 percent of married couples after fifteen months of program effort. In India, Nirodh achieved a current user level of about 2 percent of all couples with wives of reproductive age.

Cost effectiveness. Cost-effectiveness studies are an important measure of the performance of nonclinical programs, as the ultimate diffusion of this approach may well depend upon its expense relative to that of other types of delivery systems. Low costs and high impact obviously make a program more desirable.

Estimates of cost per new acceptor in household distribution projects range from US$1.90 for an urban area in Bangladesh (not including the cost of donated supplies and equipment) to more than US$20 in Korea and Hong Kong. The higher estimates represent programs just starting or attempting to reach a fairly inaccessible population. The small-scale Korean project, although expensive, was within a few dollars of the cost per acceptor in the national program and was still experiencing start-up costs. The household distribution program in the new territories of Hong Kong was directed at a target population considered especially difficult to reach, and it is likely that these acceptors would never have been reached without the program.

For village-level projects, published estimates of costs prior to 1976 have ranged from US$2.50 to more than US$12 per acceptor. Colombia's rural Profamilia project established a cost of US$6.28 per new acceptor, which compared with a cost per new acceptor of US$7.12 in

Ministry of Health clinical projects and a cost of US$16 per acceptor in the postpartum program.

In commercial programs determination of costs is especially difficult because of the lack of routine statistics on acceptors. Consequently, requisite information has to be gathered from special surveys. Based on data from a Knowledge, Attitude, Practice (KAP) study one year after start-up, the Preethi condom project in Sri Lanka estimated costs of US$2.16 per new acceptor, US$6.19 per couple-year of protection, and US$31 per birth averted.

The limited evidence indicates that the cost per acceptor in nonclinical programs during the first year of operation compares favorably with costs in established projects of other types.

New Trends. Community-based and subsidized commercial programs for the distribution of contraceptives may be the most widespread example of a more general movement to overcome the shortage of medical professionals and facilities in the developing world and to bring health care to people through simplified delivery systems. Many developing countries are experimenting with the use of a single, community-based delivery system to distribute worm-control medicine, vaccines, obstetrical supplies, and nutrition supplements along with contraceptives. Bangladesh, for example, which has several community-based contraception projects, is also trying oral rehydration treatments that can be administered in the home for diarrheal diseases without involving medical personnel. In China, "barefoot doctors" and members of worker's committees distribute contraceptives as only one aspect of a much broader, community-based health care system.

Conclusions. Both the number and variety of community-based projects have increased rapidly during recent years. Systems for household, institutional, mail order, and vending machine distribution have been added to

the original community approaches. As of 1979 there were many projects serving small populations, and large-scale programs existed in Bangladesh, Egypt, Nicaragua, Mexico, Indonesia, India, Philippines, South Korea, Sri Lanka, Thailand, Colombia, Brazil, and Jamaica.

Most evaluations of nonclinical programs have concerned the attainment of basic, short-term administrative objectives such as setting up the distribution system and recruiting acceptors. As a result, most available information focuses on counts of distribution points, contraceptives distributed, new acceptors and their characteristics, and revisits. For a few programs, however, data are available that shed light on such questions as the demographic impact of nonclinical distribution programs and their ability to provide widespread, cost-effective coverage to the populations they serve. All conclusions must be considered tentative because of limited data, but it appears that in many circumstances nonclinical programs are more effective and efficient than clinical programs. Acceptance and continuation rates and prevalence increases have fallen within ranges that are considered acceptable in most clinical programs, and they have done so in the kinds of areas that clinical programs find it difficult to serve. Moreover, the costs of nonclinical projects seem competitive everywhere with those of other types of family planning programs.

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3.
UNITED STATES

The family planning program in the United States is composed of many diverse and separate elements: a large number (about five thousand in 1980) of public and non-profit family planning clinics, used mainly by low-income women; various federal and state financing authorities that subsidize the clinic programs; and private physicians who independently offer contraceptive services to their patients, some of whom are low-income. Federal family planning efforts were designed to address the problem of unwanted childbearing, particularly among low-income families, by improving their access to contraceptive services and providing education and counseling about reproduction and birth control, thus helping people to initiate contraceptive use or to use more effective contraceptives.

History. The delivery of family planning services in the United States is a relatively recent addition to preventive health services. President Dwight D. Eisenhower in 1959 summed up the prevailing view regarding public support for birth control when he stated, "I cannot imagine anything more emphatically a subject *not* a proper political or governmental activity." Anything connected with sex was considered controversial in a nation that had lived for nearly a century with the restrictive Comstock Laws, which among other things prohibited the importation and mailing of contraceptives. Birth control was particularly offensive to the Roman Catholic church, whose communicants made up close to a fourth of the population. Until the mid-1960s, only a few public health departments in the southern region of the country and several large teaching hospitals included the provision of contraceptives among their maternal health procedures. Family planning advice and prescriptions could be obtained only from a private physician in the office or from one of about 150 private nonprofit clinics operated by Planned Parenthood affiliates serving no more than 150,000 women, most of whom were married.

A landmark event was the successful campaign waged by leading physicians and birth control advocates in

New York City in 1958 to reverse the long-standing ban on contraceptive provision in the city's twenty-two municipal hospitals (Rock, 1963). The important elements of the controversy were the "legitimation of birth control as an integral part of regular medical services, coupled with recognition of voluntary action and respect for varying religious beliefs" (Jaffe, 1967, p. 151). In the late 1960s, federal support for family planning services was spurred by a rapidly changing social environment. Documentation of the saying that "the rich get richer and the poor get children" was provided by a series of national fertility studies showing that poor families, with more than twice the incidence of unwanted fertility than other families, were denied access to modern birth control methods—pills and intrauterine devices (IUD's)—largely as a result of economic barriers. Such families did not have private physicians, and few public agencies provided family planning services. Thus, new community action programs, specifically addressed to solving the problems of poverty, included voluntary family planning among their roster of services. Further national support arose because the high birth rates of the late 1950s created concern in the 1960s about incipient overpopulation. In addition, the interrelated issues of women's rights, sexual freedom, and health rights began to be discussed. An unusual coalition resulted of groups concerned with reducing poverty, limiting population, cutting back on welfare, improving access to preventive health care and upgrading the status of women. While many of these groups had little in common, the assumption of responsibility by the federal government for the provision of family planning services to women who needed and wanted them was one step toward the solution of their broader concerns.

Legislation and Organization. Official federal policy regarding the delivery of subsidized family planning services dates from 1966 when family planning was singled out as one of four critical health problems in the President's Special Message to Congress: "We have a growing concern to foster the integrity of the family, and the opportunity for each child. It is essential that all families have access to information and services that will allow freedom to choose the number and spacing of their children within the dictates of individual conscience" (Lyndon B. Johnson, 1966).

A supportive policy statement was issued in the same year by the Department of Health, Education, and Welfare (DHEW) making it clear that family planning in the United States was an individual health and social concern rather than a response to population pressures. This statement was followed in 1967 by amendments to the Economic Opportunity Act, giving family planning special emphasis in programs in the Office of Economic Opportunity, and to the Social Security Act, earmarking 6 percent of maternal and child health funds for family planning services and requiring that such services be made available to recipients of public assistance. The major enabling legislation, the Family Planning Services and Population Research Act (Title X of the Public Health Services Act) was passed by Congress in 1970; it mandated the organization of a broad family planning program for the nation. At that time Congress authorized the expenditure of $382 million for a three-year program of services and research and established an Office of Population Affairs in DHEW (since 1980 the Department of Health and Human Services), charged with coordinating activities of the various agencies involved. Family planning programs are currently the responsibility of the Bureau of Community Health Services of the Health Services Administration; the biomedical, social, and behavioral research program is administered by the Center for Population Research, National Institute of Child Health and Human Development of the National Institutes of Health. The National Center for Health Statistics collects fertility data and the Center for Disease Control conducts selected evaluation and monitoring studies. A unique legislative enactment required the Office of Population Affairs to produce for Congress an initial five-year plan (U.S., Senate, 1971) and annual updates. The initial report submitted to Congress projected a detailed program delineating the responsibilities of the different federal, state, and local agencies; subsequent updates have analyzed the gap between needed services and availability (U.S., Office of Population Affairs, 1978).

Needs and Services. The national family planning program is directed at three specific groups of women at risk of unintended pregnancy: those with low incomes, who cannot afford care by private physicians; those with marginal incomes, who may not be able to afford care by private physicians; and teenagers, who often do not have access to private physicians for contraceptive care. Federal funds are made available to ensure that no one may be denied access because of income, age, sex, marital status, or residence.

Number who need clinic services. Estimates of the number of women at risk of unintended pregnancy and in need of family planning clinic services have been made for every U.S. county, state, and region. By definition, these women are in their prime childbearing years (15–44), sexually active, fecund, and not intentionally pregnant or trying to become pregnant (Dryfoos, 1975). About 65 percent of all low-income and marginal-income women and 47 percent of all adolescent women were at risk in 1979 and, it is assumed, needed access to subsidized clinic services in order to receive contraceptive

care. Application of these proportions to population figures results in the estimate that about 13.1 million U.S. women were in need of organized family planning services in 1979, shown in Table 1. (Women in families with incomes below 150 percent of the poverty level are considered low-income and between 150 and 200 percent are considered marginal-income. The federal poverty index in 1979 was $7,450 for a family of four; the low-income level was $11,175 and the marginal income cut-off was $14,900.)

Clinic services. Almost 4.5 million women received family planning services from clinics in 1979; most of the women using the services were in low-income and marginal-income families, and 1.5 million were adolescents. Clinic procedures are defined for federally funded programs in program guidelines; these regulations are monitored by the Bureau of Community Health Services of DHHS, which manages the Title X funds through ten regional offices (U.S., DHEW, 1977). Patients routinely receive individual or group instruction and counseling or both, physical examinations, prescriptions, referrals if necessary, supplies and follow-up. (Pills are available only by doctor's prescription in the United States with clinics acting as supply depots for patients.) The guidelines call for a gynecological examination and laboratory services (such as a hemoglobin or hematocrit test, urinalysis, a Pap smear, a gonorrhea culture, a syphilis test, and a pregnancy test). Many other tests and services are available at clinics or through established referral networks. The return visit protocol is to have patients on pills return three months after the initial visit and every six months thereafter. Medical records must be maintained with maximum regard for confidentiality, and signed, informed consent is sought for every patient before she receives contraceptives.

Because of the large caseload and the emphasis on laboratory services and tests, the organized family planning program has become the primary purveyor of health screening for low-income and adolescent women in the United States. In 1979, the family planning delivery system provided 3.5 million different women with Pap smears and breast examinations; 3.9 million women had blood pressure tests and 3.2 million obtained tests for venereal disease (VD).

The Family Planning Delivery System. Most low-income women in all parts of the country have access to one of the five thousand sites at which family planning is offered. A recent review identified only 126 counties (out of 3,105) where services were not available, containing an estimated 74,000 low-income at-risk women, less than 1 percent of the nation's women in need (U.S. Office of Population Affairs, 1978). Clinic facilities are directly operated by 2,681 different agencies: 353 hospitals, 1,499 health departments, 187 Planned Parenthood affiliates and 642 others including Community Action agencies, Community Health centers, and free clinics. More than 1.8 million women, 40 percent of all family planning patients, are served in health department clinics, up from 400,000 in 1969 (Figure 1). In the earlier years, hospitals played a much more important role in the delivery system; however, their portion of the caseload has decreased from 26 to 13 percent, while the patient number peaked in 1973. Planned Parenthood affiliate and other agency caseloads grew steadily throughout the 1970s. More than 40,000 staff members were reported by family planning clinics; most employees work part-time at family plan-

TABLE 1. *Estimated number and percentage of women at risk, according to use of clinics and private physicians, 1979* (numbers in thousands)

	Total in need of family planning services	Low-income & marginal-income women			Women aged 15–19		
		Total	Aged 15–19	Aged 20–44	Total	Low-income & marginal-income	Higher-income
Number at risk	13,138	10,583	2,276	8,307	4,831	2,276	2,555
Number served	7,627	6,635	1,692	4,943	2,684	1,692	992
In organized clinics	4,254	3,899	1,123	2,776	1,478	1,123	355
By private physicians	3,373	2,736	569	2,167	1,206	569	637
Number not served	5,511	3,948	584	3,364	2,147	584	1,563
Percentage served	58.1	62.7	74.3	59.5	55.6	74.3	38.8
In organized clinics	32.4	36.8	49.3	33.4	30.6	49.3	13.9
By private physicians	25.7	25.9	25.0	26.1	25.0	25.0	24.9
Percentage not served	41.9	37.3	25.7	40.5	44.4	25.7	61.2

Sources of data. Number at risk: Alan Guttmacher Institute, 1981, app. C, p. 1. Number served: Torres, Forrest, and Eisman, 1981, tables 8 and 9. Distribution within age and income: Alan Guttmacher Institute, 1979, app. B, table 7; applied 1977 distributions by age and income to 1979 totals.
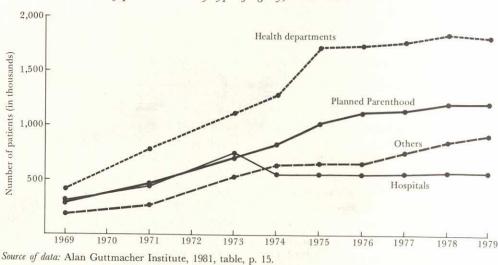
FIGURE 1. *Number of patients served by type of agency, 1969–1979*

Source of data: Alan Guttmacher Institute, 1981, table, p. 15.

ning and some are volunteers (Morrow, 1978). Nurse practitioners are frequently employed by family planning agencies.

One of the most important characteristics of the family planning delivery system is its diversity, as shown by the complex mix of agencies that developed service sites after federal funding became available. From the earliest development, funding decisions by federal officials at the regional level reflected the differences in the health delivery systems that were already in place, for example, whether or not there were public health clinics, community action programs or Planned Parenthood affiliates.

This delivery pattern also reflects the impact of consumer behavior, since women have varying needs that can only be met in varying kinds of clinic settings. Some prefer single-purpose family planning clinics, while others want to receive their contraceptive care in a broader medical context such as that found in maternal and child health services.

States vary significantly in their mix of agencies providing family planning and in the organization of the family planning program at the state level. In almost every state, a lead agency has been designated to coordinate the program and to allocate state and federal funds to local clinics. In all southern states and some others, the state Health Department has undertaken this role, usually through an Office of Family Planning located in the Division of Maternal and Child Health. In several states and large metropolitan regions, a nonprofit (nongovernmental) coordinating agency has been incorporated to receive and allocate government grants and contracts, plan and monitor services, and organize training and other kinds of technical assistance.

Health Systems Agencies, the official regional health planning bodies in the United States also have been involved in the family planning delivery system. Through representative boards, they must review all federal project grants for family planning and other health services. They also issue "certificates of need" for abortion clinics and make recommendations regarding hospital use and policy.

Patient statistics. From 1969 to 1977, a national reporting system for family planning services was operated by the National Center for Health Statistics. This system had the capacity to collect uniform unduplicated patient data from most of the family planning clinics in the nation. Because of the high cost of centralized data processing, the system was converted to a sample for the purposes of generating national-level reports. However, some forty-two regional and state data systems continue to operate, providing data to local programs for management, planning, and evaluation.

From the reporting system, it is known that patients of family planning clinics are often young and nulliparous: one-third are aged 19 or younger and 57 percent report no live births. More than two-thirds of the patients are white, closely mirroring estimates of the women in need. Many of the young patients have never used birth control prior to their first clinic visit so that the result of their visit is to upgrade substantially the effectiveness of their contraceptive method. Table 2 presents the percent distribution of new patients according to the contraceptive method used before and after their clinic visit. For teenaged patients, 73 percent used no prior method; at the last visit, 69 percent selected the pill, 2 percent the IUD, and 4 percent the diaphragm. (The proportion of all patients who select the pill has decreased from around 70 percent during most of the 1970s to 60 percent in 1979;

TABLE 2. *Percentage distribution of new female patients of organized family planning programs, according to age, by contraceptive method used prior to and after clinic enrollment, 1979*

Method	All patients		Below 20		20–29		30 and over	
	Method used prior to clinic enrollment	Method used at last clinic visit	Method used prior to clinic enrollment	Method used at last clinic visit	Method used prior to clinic enrollment	Method used at last clinic visit	Method used prior to clinic enrollment	Method used at last clinic visit
Oral	31%	60%	19%	69%	45%	55%	40%	30%
IUD	4	4	1	2	6	7	11	11
Diaphragm	3	7	1	4	4	10	7	12
Foam/jelly/cream	4	7	3	6	5	8	7	12
Natural family planning	1	1	1	—[1]	1	—[1]	2	2
Relying on partner (condom)	—[2]	6	—[2]	5	—[2]	6	—[2]	11
Sterilization	—[1]	1	0	1	1	1	2	4
Other	2	1	2	1	2	1	3	2
No method	55	13	73	12	36	12	28	16
	100%	100%	100%	100%	100%	100%	100%	100%

[1]Less than 1 percent.   [2]Not separately identifiable.
SOURCE: Alan Guttmacher Institute, 1981, table 18; adapted by permission.

IUD use has also dropped by about 10 percentage points while diaphragm use has increased by 5 points.) The upgrading effect of the clinic program has even greater salience in view of recent research demonstrating that adolescents who never used contraception are ten times more likely to have experienced a pregnancy than those who always use a medical method, 62.2 percent compared to 10.9 percent (Zelnik and Kantner, 1980).

Funding of services. In 1979, the total of financial resources available for organized family planning clinics was estimated to be about $325 million, averaging $70 to $75 per patient served during the year. Approximately 72 percent of these funds came from federal sources, about 16 percent from state appropriations, and the remainder from patient fees.
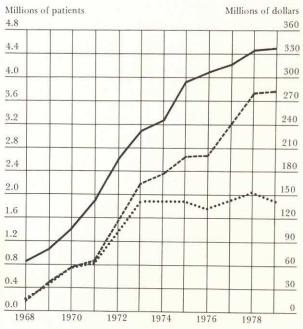
It is interesting to compare the growth of the organized family planning program in the United States with the infusion of federal funds from the various sources. Figure 2 shows the increases in both patients and federal dollars with little difference in the shape and direction of the changes. The caseload grew significantly in the early 1970s; in 1972, more than 700,000 patients were added. In mid-decade, program growth almost halted as did any increment in federal funding. Title X projects grants remained frozen at 1974 levels for several years, and programs were directed to seek support from the state-controlled, third-party reimbursement schemes. (Medicaid and Title XX of the Social Services Act are third-party

schemes; that is, the local provider of medical services [the vendor] is reimbursed by a state funding agency after submitting a bill [a voucher]. Each state sets the amount of reimbursement for a particular service rendered in that state. The patient is not involved in the financial transaction.)

While federal funds for family planning grew throughout the 1970s, the increases were never sufficient to catch up with the inflationary trend and much of the expansion of the program between 1973 and 1979 can be attributed to greater efficiency in management rather than higher levels of support. In 1981, the Title X legislation continuing family planning as a categorical program was renewed by Congress for three years despite opposition from some congressmen and special interest groups. An effort was made to fold the family planning program into a preventive health block grant directly to state governments which threatened to end the visibility and accountability of the family program as it is now organized. The continuation of Title X represented an important affirmation of the acceptance and support the family planning program has received, particularly at the local community level. However, the 1982 budget will reflect sizable cut-backs in all human services, and it is likely that Title X funds for family planning may be reduced by more than 25 percent.

Evaluation. Using the family planning data system, family planning programs have been monitored over the

FIGURE 2. *Number of patients served annually by family planning clinics in the United States, estimated annual federal expenditures* for medical family planning services, and estimated annual federal expenditures in constant (1970) dollars, 1968–1979†*

Millions of patients   Millions of dollars

————— Number of patients   ▄▄▄▄ Estimated annual federal expenditures
•••••••• Estimated annual federal expenditures (constant dollars)

*In some cases, expenditures had to be estimated from reports of appropriations, allocations, and obligations. Estimates of Medicaid (Title XIX) and social services (Title IV-A, XX) payments for 1968–1973 are rough estimates and include indeterminate amounts of support for abortion services and for counseling. These estimates of expenditures do not include migrant and Indian health family planning funds; Office of Economic Opportunity Funds for headquarters or special projects; research funds expended under Title X; and, for 1974–1977, Title X, Title IV-A and Title XIX funds expended for abortion or counseling services.
† Patient data are for FY 1968–1974 and CY 1975–1979; expenditure data are for FY 1968–1979.
Sources of data: Family planning project grant lists; AGI surveys of state Medicaid agencies and state health and welfare agencies; published tables, Medicaid; personal communications with state health and welfare officials; and various published reports.
SOURCE: Torres, Forrest, and Eisman, 1981, fig. 3; reprinted by permission.

past decade to compare growth and distribution with county-level estimates of need. Initially, the Title X project grants were awarded on the basis of sheer volume of need, favoring central city agencies; more recently an indicator, the percentage of the women in need served, has been used to pinpoint rural areas with priority for expanded service. Evaluation studies have shown that counties with the most successful programs had the greatest mix of sources of family planning care (e.g., health department, Planned Parenthood, hospital, and other types).

Private physicians also provide family planning services for some low-income women and sexually active adolescents. A comparison of the family planning need figures with the service data in Table 1 shows that organized clinics served 32 percent of the need and private physicians served 26 percent in 1979. The remaining unmet need for family planning services was approximately 5.5 million: 3.9 million low-income and marginal-income women and 1.6 million higher-income adolescents. Almost three-fifths of the target population for this program was reached in a twelve-month period. Many clinic patients, however, make only one visit to a clinic and never return. Follow-up studies have shown that most clinic "dropouts" either continue contraceptive use under the care of a private physician or at another clinic or discontinue use because they are no longer sexually active. This suggests that the initial clinic visit is the major contact point between the system and the patient.

Two interesting studies have shown the effects of a program upon unwanted pregnancy rates and general fertility rates: one indicated that users of organized family planning services had markedly lower rates of unintended pregnancy after use of a clinic than in previous time periods (Okada and Gillespie, 1977); the other estimated that the effect of the organized family planning program on the fertility of low-income women, independent of other factors, was statistically and substantively significant (Cutright and Jaffe, 1977). Data from periodic national surveys of fertility have demonstrated a significant national decline in unwanted fertility, particularly among poor families, and the linkage between the use of more effective contraception and these changes in fertility patterns. While vital statistics give evidence of a marked decrease in the fertility rates of women at almost every stage, the studies lack sufficient data to prove that the federally subsidized programs can take full credit for such changes. It is probably a safe assumption, however, that the convergence in the use of modern medical contraceptive methods by poor and nonpoor, married and unmarried, white and nonwhite women could not have been achieved without the implementation of a broad-based, national, family planning program to supplement the role of private physicians.

Changes in the Delivery System. The family planning delivery system in the United States may be described as specialized or "categorical"; almost three out of four of the five thousand clinic locations have as their primary purpose the provision of family planning services, even in health departments (Morrow, 1978). The remainder of the clinics provide contraception along with obstetrical, gynecological, family health, and other more general services. A recent trend, however, has been for agencies that started as specialized family planning clinics to

broaden the scope of their programs and to offer additional medical services such as out-patient abortions and sterilizations, genetic screening, prenatal care, maternity care, and infertility services. New demands are arising for special services for adolescents, males, the handicapped, and other groups.

At the same time, another kind of fertility-control agency has entered the U.S. health delivery system. Since 1973, when the Supreme Court legalized the provision of abortions, an increasing number of abortions have occurred in free-standing, nonhospital, out-patient abortion clinics. These clinics provided close to three-fourths of the 1.5 million abortions in 1979; like the family planning clinics, they have also begun to diversify and to offer contraceptive services, sterilization, and prenatal care; a few have become birthing centers for out-of-hospital deliveries.

The family planning field in the United States is in a process of transition. It encompasses an ever increasing territory of reproductive health care and social and biological education, crossing medical and social service, home, school, and community lines. These changes reflect the recognition that the problem of unintended pregnancy in the United States cannot be addressed solely by family planning providers operating in isolation from other social, health, and welfare efforts.

<div align="right">Joy G. Dryfoos</div>

For related articles on the United States, see ABORTION; CONTRACEPTIVE USE; LAW AND FERTILITY REGULATION.

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4.

MANAGEMENT AND EVALUATION

Management is a process that involves planning, staffing, organizing, and controlling the activities of an organization for the purpose of achieving certain objectives; evaluation is a process directed at measuring the organization's achievement of its goal. Certain managerial concepts and evaluative frameworks have been adapted from experience in other areas in health and social service and in industry, and applied to family planning programs. Other concepts have been designed specifically for use in family planning. This article will discuss development of managerial and evaluation activities in family planning programs and some specific methods of management and techniques of evaluation. The term "management-oriented evaluation" refers to evaluation directed toward improving managerial decisions, as differentiated from evaluation that measures achieve-

ment of objectives but provides no direct linkages to making decisions about the program.

Development of Techniques. During the 1960s, family planning programs grew from small, tentative activities into national undertakings. The early efforts were often run by charismatic leaders, who tended to manage informally and intuitively. The development of large-scale programs was accompanied by organizational complexity; employment of hundreds or thousands of workers (from highly trained professionals to narrowly focused auxiliaries and support personnel); variety in programmatic approaches (clinics, camps, community-based delivery, postpartum); and growth in magnitude and sources of financing. All these changes forced attention to the need for sounder systems for the improved management of family planning programs, including planning, supervision, supply, record keeping, and information feedback, in order to achieve program objectives.

Like management, evaluation in family planning programs underwent considerable change. It developed from very simple beginnings such as retrospective one-time, assessment of program activities to extensive, on-going, analytic activities, including feedback of findings to managers for future program improvements.

There are many models of family planning program evaluation, each of which provides a framework through which to examine major aspects of a family planning program. Broadly speaking, they all attempt to measure the degree of achievement of short-range, intermediate, and long-range program objectives; to relate measures of achievement to program inputs and to nonprogram factors; to determine how and why the achievements were accomplished; and to communicate evaluation findings to planners and administrators for program improvement or redefinition of objectives or both. They call for similar data bases and information systems, that is, combinations of program service statistics, census reports and vital statistics, continuing and unique sample surveys, and special studies.

In addition, a variety of techniques have been developed to measure program accomplishments. Many of these techniques are associated with different types of objectives, but the data collected may not always be in a form that is accessible to managers. Some data traditionally gathered by evaluators for other purposes can be applied very productively in management-oriented evaluation, and some techniques can be modified for use in gathering and analyzing data relevant to management. Some techniques developed in the management field, moreover, can be utilized effectively in evaluating family planning programs.

Techniques of Management-oriented Evaluation. Reviewed here are a number of the techniques available for management-oriented evaluation. What follows is not a comprehensive list, but it highlights some of the most important techniques.

Setting operational targets. Techniques for planning and setting targets abound. They generally have been used for long-term program planning—in which the principal steps are selection of demographic objectives, choice of time frame, derivation of number of births to be averted, and estimation of contraceptive method mix and effectiveness needed—and for setting middle-range targets, such as number of those using contraception to be served (to avert a given number of births). These techniques have also been adequate for use in setting operational targets, such as the number of clinics to be opened, community-based distribution outlets to be operated, and workers to be trained.

Population in need of service. By estimating the population in need of services, according to the approach developed for the United States (known as the Dryfoos, Polgar, Varkey formula), program managers can make informed judgments about the scope of services to be offered by a program in a given area. This technique combines relevant demographic and biological research findings with socioeconomic data from census and other sources to provide refined estimates of the size and composition of the population eligible to be served. On the basis of such data and program policies, managers can make decisions on clinic numbers and sizes, method mix, professional requirements, and so on.

Risk factor analysis. Risk factor analysis is based on the notion that certain characteristics predispose women to higher health risks should they become pregnant. By scoring women for these characteristics, it is possible to assign cases to various operational priority categories: for example, high priority for counseling, for contraceptive services, follow-up, for referral. Risk factor analysis has been employed by planners to identify high-risk groups in the population and by family planning workers in providing services on a case-by-case basis. It may also be used by management-oriented evaluators to determine the extent to which a program is serving that portion of the population subject to particular health risks.

Caseload forecasting. Caseload forecasting involves estimation of future demand for services from current enrollments and dropout rates. These techniques enable administrators to estimate, for a future date, the expected number of family planning clients who will be active, the enrollment needed to meet a given target of active clients, the expected number of clients who will have been served at least once during a given year, and the number of clinic visits and clinic sessions that will be required in a given year.

Manpower planning. Staffing decisions are frequently made on the basis of manpower availability and accepted norms of service. To the extent such decisions can

be based upon the kind of information obtained through one of the three techniques described above, deployment of staff will be more effective and efficient. Manpower planning based on such estimates will ask, for example, whether the numbers and types of workers having the proper training and skills required to meet the program's services goals are being provided at the appropriate times and places. There are several techniques for such analysis, which may also be used for monitoring the extent to which manpower plans are being realized and for updating plans as new information becomes available.

Administrative monitoring. Measurement of progress toward program objectives and identification of strengths and weaknesses in the program are clear management needs. Is the program working well? Which program components are more successful? Which are less successful? Which units are working efficiently and which are not? Answering questions such as these is the goal of administrative monitoring, which focuses on short-term results. The sources for such information for the most part already exist.

Indicators based on service statistics. Service statistics—information generated by program personnel in their day-to-day work—serve different purposes at different levels of family planning programs. Detailed data are collected at local levels for use in local decisions and are summarized, condensed, or otherwise classified for analysis and decision making at higher levels. Service statistics may be used for individual client care, program operation, administrative monitoring, measurement of program activity, supervision, evaluation, and research. They contribute to most of the other evaluation techniques discussed in this article.

Most programs routinely collect service data and produce analyses and reports describing program activity: for example, number of clients, number of visits, methods accepted, workers employed, and facilities used. Evaluators can combine some of these measures to describe activities in terms of the accomplishment of program objectives. A useful tool in taking this step is the indicator, defined as "use of a service statistic to ascertain or estimate the status of a particular aspect of program performance," usually in combination with an objective.

Indicators may be applied to a range of items, such as individual workers, groups of workers, operating units, areas, countries; to categories of services; and to supervision. They may make quantitative statements or simply suggest degrees of achievement. For evaluation of services, five types of indicators may be identified, each based on a series of service statistics: (1) volume indicators, which measure, for example, amount of services rendered, facilities and personnel, money spent, and clients served; (2) coverage indicators, measuring the extent to which services are provided to various groups in the population; (3) quality indicators, including measures of emphasis, comprehensiveness, timeliness, span, duration, continuity, and satisfaction; (4) effectiveness indicators, measuring the extent services are contributing to achievement of program objectives; and (5) efficiency indicators, which relate other indicators to units of input, usually cost but occasionally services and facilities.

Supervision. An extension of "management by exception" is called "selective supervision." This technique utilizes service statistics to develop indexes that will easily identify those operating units that require special supervisory attention. The underlying philosophy is that units falling at the extremes of any index or group of indexes require some type of supervision; such extreme units either are doing something very good (which should be learned and extended to other units) or they are doing something very poor (which requires correction). For example, in examining method mix, if for all clinics the average proportion of intrauterine devices (IUD's) among all methods is about 50 percent, a clinic with 10 percent IUD's and one with 80 percent IUD's would be identified, examined, and supervised more closely (if the disparity were indeed an indication of exceptional operations, and not just "random variation" for a short period).

Process analysis. The objective of process analysis is to "improve program operations by improving the way the activities are carried out." (Process analysis is not really an evaluation technique but is instead an approach to studying program activities in which a number of study designs have been used.) While indicators based on ordinary data sources may be used to monitor the major areas of a program, this approach usually involves in-depth analysis of a particular process. The basic strategy of process analysis is identifying the activity to be studied; defining its objectives and selecting appropriate performance measures; describing the activity in terms of its most important inputs, outputs, effects, and constraints; defining the elements of the process and the ways in which they relate to one another; and observing, measuring, and evaluating the process to determine how and why it works, its strengths and weaknesses, and its most significant attributes.

Measures of achievement. Most measures of achievement in family planning are addressed to relatively long-term demographic objectives, such as births averted and fertility decline, whose methodologies are too complex for routine management. Two relatively simple techniques, described below, the couple-years of protection and the standard couple-years of protection, which were developed specifically for administrators, bridge the gap between demographic and managerial requirements.

Couple-years of protection. The couple-years of protection (CYP) index sums and compares the protection of-

fered by different contraceptive methods in terms of the protection time to a couple conferred by each method. The index assumes the equivalency of time and users in computing contraceptive use; for example, it is assumed that use by twenty women of a contraceptive for fifty months each has the same consequences in terms of fertility forgone as fifty women using the method for twenty months each.

The index thus permits one to express achievement as a combination of users and length of use, without separately identifying either. By developing equivalent values based on the duration of contraceptive protection conferred by different methods, managers can utilize contraceptive distribution figures to evaluate program accomplishment as well as to compare performance of individual program operating units.

Standard couple-years of protection. A recent improvement in the CYP approach, the standard couple-years of protection (SCYP), permits the assessment of program accomplishments in terms both of protection against pregnancy and of births averted by contraception, sterilization, and abortion. The SCYP provides for adjustment for the different fertility expectations of couples of different ages, overlap between contraceptive use and postpartum amenorrhea, and different degrees of contraceptive effectiveness.

Cost concerns. Much attention has been given to cost in family planning programs, particularly to the task of relating cost to achievement in order to develop measures of cost-effectiveness. Other measures of cost are needed by managers, especially measures of efficiency, or "the relative costs of providing services or of achieving effects."

Detailed information on cost is needed for accurate assessment of cost-effectiveness and efficiency. In addition to counting numbers and types of workers, filled and vacant positions, trained and untrained staff, and so on, all program inputs may be stated in monetary terms: cost for categories of program activities, including services, education, training, information, research, and evaluation, and cost for categories of administrative expenditures, including personnel, facilities, supplies, and equipment. Guidelines to the classification of expenditures provide a useful checklist and, when used together with the various available measures of achievement described earlier, permit assessment of both cost-effectiveness and efficiency.

The challenge facing evaluators and managers is to conduct relevant studies using appropriate techniques and to channel findings into decision making that will lead to program improvement.

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5.

EFFECTS ON FERTILITY

This article reviews the leading methods used to measure the effects of family planning programs upon fertility. Programs have, of course, effects on many other variables, but even considering only fertility there is no single preferred technique of evaluation. The societies in which family planning programs are relatively widespread are generally undergoing rapid social and economic changes as well, and these changes have their own effects on fertility, which complicate the task of focusing on the program's special contribution.

There is no widely accepted classification of the techniques used to appraise family planning effects on fertility. Two United Nations publications (1978, 1979), however, present a rather comprehensive list. Many of these techniques are also treated extensively by C. Chandrasekaran and Albert I. Hermalin (1975), and these three

publications represent the starting point for readers wishing to pursue this topic in great detail.

Classification of Methods of Evaluation. This section presents a brief overview and classification of evaluation techniques, while the succeeding sections provide a brief description of each. Table 1 presents a list of the eight techniques to be discussed, cross-classified by the type of effect they are able to measure and by the type of data typically employed. These two dimensions were chosen because together they highlight the similarities and differences across methods.

The question of type of effect requires some elaboration. Family planning programs provide contraceptive services and advice to interested couples. One way of grouping their impact is to count the number of couples served, take account of the length and effectiveness of use, and then translate these data into the effect on fertility. This is basically the approach to measuring impact taken by techniques 3 through 6, and it will be seen that their configurations in Table 1 are very similar. They differ in how they proceed to translate the program data into fertility effects and, to a certain extent, in the range of other data utilized.

Techniques 3 through 6 yield estimates of program effect only, and data from the family planning program constitute the major input. Each technique requires, at least in its most sophisticated form, a series of detailed calculations; only the general nature of the approach can be addressed in the brief review. The four methods differ in a number of ways; we call attention here to variation in the time dimension. The chief distinction is between allocating program effects over calendar time versus obtaining a summary effect per acceptor or year of acceptance for all the births averted over time.

As noted above, many of the countries with family planning programs are also undergoing socioeconomic change, and it has been held by some that it is really the changes in educational levels, urbanization, occupational structure, and the like that result in increased contraceptive use and hence lower fertility, rather than, or in addition to, the effects of the family planning program. This position has led to the development of techniques that seek to assess the nonprogram effects and to evaluate them vis-à-vis the role of the family planning program. Conceptually then, as shown in Table 1, we may think of program effects, nonprogram effects, and the total effects that arise from both sources. Techniques 1 and 2, standardization and trend analysis, rely on demographic data to estimate the total effect; trend analysis, in addition, produces estimates of nonprogram and program effects. The program effect in trend analysis is considered implicit because it does not rely on any program variables to trace through the impact of the program. Techniques 7 and 8 also produce estimates of all three effects but require a greater array of data or more control over program operation, as their detailed exposition will indicate.

Consideration of program and nonprogram effects introduces another conceptual issue. It is usual to distinguish gross program effect from net program effect. In the former, the program is credited with all acceptors from the public sector, including those who switched from private sources and, more hypothetically, those who might have initiated use from a private source in the absence of a public program. By the same token, gross program effect does not reflect the catalytic impact of the program—those encouraged by the program to adopt contraception but who use private sources. Net program effect, by contrast, would take into account the net bal-

TABLE 1. *Techniques for measuring effect of family planning program cross-classified by type of effect and type of data*

Technique for measuring effect of family planning program	Type of effect analyzed			Type of data employed			
					Nonprogram variables		
	Program effect	Nonprogram effect	Total effect	Program variables	Socio-econ.	Demog.	Biological
1. Standardization	—	—	√	—	0	√	—
2. Trend analysis	I	√	√	—	—	√	—
3. (Standard) Couple-years of protection	√	—	—	√	—	√	0
4. Analysis of reproductive process	√	—	—	√	—	√	√
5. Component projection	√	—	—	√	—	√	0
6. Simulation	√	—	—	√	—	√	√
7. Experimental design and matching studies	√	√	√	√	0	0	—
8. Multivariate areal analysis	√	√	√	√	√	√	0

√ = effect or data involved explicitly.   I = effect obtained implicitly.   — = effect or data not generally part of technique.   0 = data of this type occasionally employed or potentially employable.

ance of these opposing trends. In the absence of the requisite data needed to estimate the substitution and catalytic factors, the distinction between gross and net program effects is basically a conceptual nicety, but it is useful in understanding what is measured by each of the techniques described in the next section.

Standardization. Standardization is not a technique of family planning program evaluation *per se* but refers to a general method of demographic analysis for studying the effect of one factor while controlling for one or more other factors. Perhaps its most familiar application is in the comparison of crude death rates across countries or over time, in which a fixed or "standard" population by age is adopted and only the age-specific death rates are allowed to vary. More formally, standardization requires that the measure of interest be expressed as an algebraic function of the components whose effects are to be determined. By keeping all components but one fixed, the effects of each factor on the composite measure can be determined.

The need for standardization in evaluating a family planning program arises because the indicators of fertility widely used to monitor change, such as the crude birth rate or the general fertility rate, are influenced by age structure and marital status distribution as well as by marital fertility. Insofar as the program's effect is only on marital fertility, one wants to control for changes in the other factors. Viewed in this way, standardization seeks only to assess whether a change in fertility that could have arisen from the program did indeed take place. Use of this procedure over a period in which the program has been in operation is thus a logical first step in assessing impact.

As indicated in Table 1, the procedure can be carried out whenever the requisite demographic factors are available. Theoretically other factors, like changing educational distributions, can be incorporated if age-specific fertility rates are available by educational category; but this is seldom the situation. In the typical application, one obtains a measure of the proportion of change in a fertility indicator, such as the crude birth rate, which is the result of changes in marital fertility. These changes in marital fertility are presumably the result of changes in birth control behavior, but they can arise from both program and nonprogram sources. To achieve a further separation requires additional information and analysis, which goes beyond the technique of standardization.

Trend Analysis. Trend analysis, in common with standardization, typically relies only on demographic data, but by using a series of measures over time, plus some strong assumptions, it provides an estimate of both program and nonprogram effects.
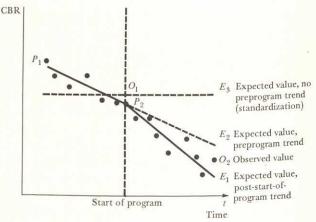
The basic methodology of trend analysis is to project the time series of fertility rates established prior to the initiation of a family planning program to a recent or current date and to compare this projected value with the actual trend in fertility that took place after the program started. If the rate of decline after the program started is greater than the trend before the program, this difference in rate is taken as evidence of program effect and estimates the magnitude of the effect. Alternately, the fertility estimated at a certain date on the basis of the preprogram trend can be compared with that actually observed, to gauge the program effect.

Figure 1 illustrates the approach and contrasts it with that of standardization. One starts with a series (yearly if available) of observed fertility measures, typically the crude birth rate or general fertility rate, which covers the period both before and after the start of a program. These are represented by the dots on the diagram. A trend line is fitted to the observations prior to the program by inspection or preferably by a statistical technique like least squares. This yields the line P_1E_2, with E_2 representing the expected value at time t on the basis of the preprogram trend. Similarly a trend line is fitted to the observations after the program has started, yielding the trend line P_2E_1, with E_1 representing the expected value at time t. Note that this line may not pass through the value observed at time t, designated as O_2, and that neither trend line may pass through the value observed at the start of the program, designated as O_1.

On the basis of these fitted lines and expected values one may compare the slope (or rate of decline) of P_1E_2 with that of P_2E_1, E_2 with O_2, or E_2 with E_1. Each of these would provide estimates of program effect and all three approaches have been used. The nonprogram effect between the start of the program and time t would be

FIGURE 1. *Representation of trend analysis and standardization*

Standardization: Marital fertility component of $E_3 - O_2$.
Trend analysis: $E_2 - O_2$, or slope of P_1E_2 versus slope of P_2E_1.

estimated as $E_3 - E_2$ and the total effect would be $E_3 - O_2$.

Figure 1 also provides a means of contrasting trend analysis with standardization. Standardization of the two crude birth rates O_1 and O_2 compares the marital fertility component of these two values. In effect, standardization is assuming no preprogram trend, but it takes into account changes in age structure and proportions married. Thus effects estimated by standardization and trend analysis can differ depending on the nature of the preprogram trend and the magnitude and direction of age structure and nuptiality shifts.

It is desirable where possible to remove the confounding effects of age structure and nuptiality shifts from trend analysis, but it is often difficult to obtain the necessary refined fertility measures over a sufficient period of time. Occasionally the total fertility rate, which removes the effect of changing age structure, will be available. Other weaknesses of trend analysis should be noted. The results often will be sensitive to the number of observations used. Adding or deleting a few observations from the preprogram trend, for example, may shift the slope considerably. Similarly, the choice of the year in which to demarcate the start of the program will often affect the results noticeably. Family planning programs often take some time to get under way, and it is not always obvious how to date their effective start. Beyond these factors is the strong assumption that in the absence of a program, fertility in the recent period would have followed the trend of the earlier period. For many countries rapid social and economic changes would have accelerated the fertility decline even in the absence of a family planning program.

Trend analysis attributes to the program not only the fertility reduction brought about by new acceptors of the program but also the effect of those who switched from less-efficient contraception outside the program to more-efficient program methods. It also credits the program with any increased use of contraception from private sources that might have been generated through the informational function of the program. Thus it incorporates the catalytic effect of the program in its overall estimate of the program impact.

Standard Couple-Years of Protection. Standard couple-years of protection (SCYP) and its predecessor, couple-years of protection, aim to develop a single index for the achievement of program work during a given year. The method estimates the total couple-years of protection, or the births ever to be averted, but does not allocate them to future calendar years. The aim is to achieve a common denominator for the different types of methods—the recurrent methods (condoms and oral contraceptives), the semipermanent methods (intrauterine devices, or IUD's), permanent methods (sterilization), and abortions. The development of an appropriate summary index permits comparison of program achievement from one year to another and from one country to another.

The SCYP measure represents refinement over the earlier couple-years of protection index (now also called crude couple-years of protection) by taking account of the age distribution of acceptors; the physiological state of women at the time of acceptance, that is, the degree of overlap of contraceptive use with the period of postpartum amenorrhea; the effectiveness of the contraceptive method; and the fertility level of the group or country under analysis.

The aim of the method is to express all contraceptive use in terms of an arbitrary standard couple-year of protection defined as "the perfect practice of a 100 percent effective contraceptive method over a period of one susceptible year by a couple representative of a group with an expected fertility rate of 400 per 1,000 women" (Gorosh and Wolfers, 1979, p. 35). The general formula to be applied to each method (excluding abortions and sterilizations, which are estimated differently) and to each age group is

$$SCYP = E[CCYP(100 - P/100) - NA/12]/400,$$

where E = the expected fertility, and $E/400$ standardizes the couple-years of protection for age and the prevailing levels of fertility;

$CCYP$ = the crude couple-years of protection (described further below);

P = the penalty applied for pregnancies and is derived from the age-specific pregnancy rate for each method;

N = the number of new acceptors of a particular method in a specific age group; and

A = the allowance in months, per acceptor, for overlap between contraceptive use and postpartum amenorrhea.

The estimate of births to be averted as a result of program activity in a given year is obtained by multiplying SCYP by 0.4.

The calculation of the crude couple-years of protection varies by type of method. For a recurrent method (oral contraceptives) the primary input is the quantity distributed to users. An estimate of wastage of supplies is required along with the mean length of protection each prescription provides. The estimate of crude couple-years of protection for oral contraceptives is thus

$$CCYP = C(1 - W)/13,$$

where C is the number of cycles distributed and W is the proportion estimated to have been wasted. This estimate

for CCYP, age group by age group, is then inserted in the formula for SCYP given previously.

For semipermanent methods (the IUD) the primary inputs for calculating CCYP are the number of acceptors and the mean duration of use.

In relation to Table 1 it will be seen that the calculation of SCYP relies in the first place on program data concerning acceptors of each method and quantities of services provided. Demographic data are required in that these data must be age-specific. In addition, the translation of the program activity into SCYP requires estimates of biological variables such as the average period of postpartum amenorrhea, the incidence of fetal loss, and the proportion of women sterile by age. In most instances these biological variables will be taken from standard tables, since country-specific data are rarely available. While the method as presently developed does not distribute births averted by future calendar years, work is under way to adapt it for this purpose.

Analysis of Reproductive Process. A set of related techniques referred to as "analysis of the reproductive process" makes use of the way contraception reduces fertility together with data on the continuation of contraceptive practice to convert protection time into an estimate of births averted per user. The steps in the process are succinctly set forth by Potter (1979, p. 76):

Four basic steps are involved. For each cohort of acceptors, practice of the contraceptive is first translated into a continuation function (i.e., proportions still using as a function of duration since acceptance); secondly, the continuation function is converted into fractional years of protection per acceptor during each succeeding year after acceptance; thirdly, the corresponding annual rates (lagged nine months to allow for pregnancy time) of potential fertility to be expected in the absence of the contraceptive are estimated; and, lastly, products of annual fractional protection and potential fertility are summed to yield births averted per acceptance.

Use of contraceptives does not reduce fertility if it merely overlaps pregnancy or postpartum anovulation. Only by use during the period between, termed the "fecundable state," can the couple interrupt the cycle of pregnancy, anovulation, and fecundability. When contraception prolongs the fecundable state, a certain amount of potential fertility is lost. The births averted by contraception are therefore a function of the length of time of such contraceptive use and the level of fertility that might have occurred during this interval. But other corrections may be necessary, as when the woman is already sterile or if the period of contraceptive use ends with an accidental pregnancy. Therefore, adjustments for these contingencies are included in calculating births averted. The process may be summarized in two equations, taken from

Potter (1979, p. 77):

$$B = 1/D \quad \text{and} \quad I = F(R - A - PW),$$

where B = births averted per segment of contraception;
I = average duration that childbearing is interrupted;
D = average duration per birth required in the absence of the contraceptive;
R = mean length of contraceptive segment;
F = proportion of couples nonsterile at time of acceptance;
A = allowance for contraceptive overlap with postpartum anovulation;
P = proportion of segments ending in an accidental pregnancy; and
W = penalty per accidental pregnancy.

The technique provides a clear estimate of births averted per user by a segment of contraceptive use. The major problems associated with the method are the sensitivity of the results to the estimate of potential fertility; the fact that the estimates of births averted are not related to calendar time so that they are of limited use in setting targets of acceptors needed to attain a desired birth rate; and the heavy data demands, particularly of biological variables. Potter (1979) has presented and illustrated a more pragmatic version of this technique, which reduces the data requirements and offers some strategies for dealing with deficient data.

Component Projection. Broadly speaking, the previous two methods combine the effective period of use of a contraceptive method with the expected fertility over that period to estimate the births averted per acceptor (or group of acceptors). Alternatively one may utilize the observed or expected period of use of a contraceptive method to project the number of women (or couples) protected at each point of time. This estimate can then be combined with the expected fertility of the acceptors to calculate births averted in a specific period of calendar time. This essentially is the approach of the component-projection technique. As with the previous two methods, a series of contingencies must be included to obtain a refined estimate. These include the possibility that part of the period of use overlaps with the period of postpartum amenorrhea; the recognition that women age as they continue contraceptive use, which alters their potential fertility and exposes them to the risk of secondary sterility; and allowance for mortality and marital dissolution.

In allocating births averted to calendar time, account must be taken of the nine-month interval between conception and birth. This means that births averted in the current year are due to birth control occurring between 1 April of the previous year and 1 April of the current year.

The procedure of measuring births averted by the component-projection method may therefore be represented as

$$B_t = \sum_i Q_{i,t} \cdot g_i,$$

where B_t = births averted in year t;

$Q_{i,t}$ = number of women in the ith age group in year t who were practicing totally effective contraception during the period from 1 April of year $t - 1$ to 1 April of year t;

g_i = potential fertility estimated for the women $Q_{i,t}$ in age group i; and

i = successive age groups of women of reproductive ages.

The calculation proceeds by assembling for each method of contraception the number of acceptors by age in each calendar year. Then continuation rates by age are applied to determine the number of women by age who will still be using that method at the point or period of interest. (This step involves both the determination of the number of acceptors of a given age who will be using the method some years later and their attained age at the end of that period.) These calculations provide the $Q_{i,t}$ of the above equation for each method; then multiplication by the potential fertility rate; and, finally, summation across age groups yields the desired estimate.

As in the analysis of the reproductive-process approach described previously, any estimate of the potential fertility rate—the fertility that the acceptors would have experienced in the absence of the program—is highly speculative. A number of different approaches have been used including the age-specific marital fertility rate of the whole population; the acceptors' own fertility in the period prior to entering the program; and the estimated natural fertility rates for the population in question.

Since the amount of calculation involved in this technique is considerable, particularly if one wishes to include the various contingencies, a computerized model called CONVERSE has been developed (Nortman, 1979). In addition to determining the births averted at various points, the program generates a great variety of useful information. In particular, it provides a comparison of a number of demographic measures (such as crude birth rate, growth rate, population size) resulting from the operation of the family planning program with those that would have occurred under natural fertility. These comparisons provide insight into the demographic impact of the program.

Simulation. Like standardization, simulation is not a technique for studying family planning *per se* but rather refers to the development or availability of models that simulate or imitate various demographic processes. Technically, the life table, stable population analysis, and many other standard tools of demography are simulation models. The advent of large, high-speed computers has permitted the development of more complex models for investigating a number of substantive and methodological questions. Of relevance for studying the impact of family planning programs are models of the reproduction process, which provide quantitative estimates of the effect on fertility of the biological factors, use and effectiveness of methods of birth control, mortality, marriage patterns and so on. With such a model, one may perform a pseudoexperiment in which the natality process is simulated for two populations, one not exposed to a family planning program. By comparing the sequence of births in the two populations, the births averted by the family planning program may be gauged.

The precise method of incorporating the family planning program variables depends on the type of model. The relevant models may be classified along several dimensions. Demographic models treat the occurrence of a birth as a probability, which can vary according to age, marital status, parity, and other factors, whereas biological models take explicit account of the determinants of the birth interval, such as fecundability, type of pregnancy outcome, and nonsusceptible periods. In a demographic model, it is possible to incorporate the number of acceptors by age, parity, or other characteristics and to alter their birth probabilities according to type of contraceptive method and duration of use. The CONVERSE component-projection technique described in the previous section is of this nature. In a biological model, the effect of acceptance is traced through the physiological parameters such as the change in fecundability, as suggested in the description of reproductive-process analysis.

Simulation models also differ in their mathematical approach. They may be analytical, expressing the interrelationships among the factors in mathematical form, or numerical, utilizing either a macrosimulation or microsimulation, almost always via computer, to yield results. In macrosimulation, the population is divided into subgroups and subjected to the interplay of predetermined proportions that will be subject to relevant events over time. (When proportions are used in this fashion, the model is referred to as a deterministic or expected-value model.) In microsimulation, the unit is the individual, who is subject to the probability of an event occurring. Whether a particular event occurs to a particular individual is determined by a random procedure, and the woman's reproductive history is created by the sequence of events so generated. Such models are termed stochastic. Models also differ in whether they are simulating a

cohort or a cross-section of a population. In general, cohort models are not able to assign family planning program effects to particular periods of calendar time.

Experimental Design and Matching Studies. Theoretically the effect of a family planning program on fertility can be determined quite unambiguously through a well-designed experiment. In this respect the approach would be similar to that of evaluating other social programs through experimental designs. Though experiments can vary greatly in their complexity and efficiency, the essential ideas can be simply stated. Consider a set of administrative units within a country (e.g., districts, provinces). Half of these are randomly assigned to receive a family planning program while the other half are not so assigned. After a suitable time interval, say three to five years, the fertility of the two types of units can be compared. The magnitude of the difference would indicate the impact of the program over this interval.

Randomization of units to receive treatment (family planning program) and of control groups is the essential feature of a true experiment. It insures that, except for random error, the two groups will be alike on initial fertility level and on the many factors that can affect fertility, such as socioeconomic structure, nonprogram use of contraception, and level of abortion. For this reason, differences in fertility at the end of the period of observation can be attributed to the differences in experimental treatment—the presence or absence of a family planning program.

Despite their attractions, experimental designs have not been widely used in evaluating family planning programs. This is partly because of the political and ethical problems involved in withholding a desirable social program from specified areas, as well as the costs and time involved in executing a proper design. A successful experiment also requires strict maintenance of the treatment over the period of observation. This means that if the treatment and control units are contaminated through communication or migration, or if the family planning program efforts are not sustained in the treatment units, misleading inferences can result. The number of units involved will determine the amount of difference in fertility between the two groups required for statistical significance. Also, it is necessary to ensure that the method of measuring fertility levels at the end of the experiment does not bias the results, as might happen if the family planning workers in the treatment areas were involved in gathering the necessary data.

More-complex designs can increase the precision of results. For example, information about initial fertility levels and other characteristics of the areas can be used to match the units prior to randomization or for statistical adjustments after the experiment. The design can be re-fined to test the effect of different kinds of program inputs rather than just the presence or absence of a program.

When the initial fertility levels of each unit are known, one can use a before-after, two-group design, in which the change in fertility for the areas with a program are compared with the change for the areas without one. The latter would reflect the nonprogram effects over the period of observation, while the difference in change between the program and nonprogram areas would provide an estimate of the additional effect of the program. This is the situation represented for experimental designs in Table 1.

Though a relatively large number of field studies have been undertaken on one or another aspect of family planning, only a small number would qualify as true experiments. One review of the literature (Cuca and Pierce, 1977) finds that in only twelve of ninety-six "experiments" were subjects assigned randomly to experimental and control groups. Studies that do not utilize random assignment are usually termed "quasi experiments" or "observational studies." One type among these that has been used to gauge the impact of a family planning program involves matching acceptors within the program with a group of nonacceptors according to a set of demographic and social variables and then comparing their subsequent fertility.

Multivariate Analysis of Areal Data. The guiding principle behind multivariate areal analysis is that changes in fertility will be the result of the effect of a family planning program as well as of changes in socioeconomic factors that influence fertility. In order to separate the program from nonprogram effects, both types of factors must be incorporated into an appropriate model of the determinants of fertility.

One way of testing the effectiveness of a program is to determine whether across the areal units within a country a relationship exists between program factors and fertility, after taking into account socioeconomic and demographic factors also assumed to influence fertility. Areal multivariate analysis thus requires a conceptual model of factors affecting fertility at the areal level and adequate operational measures for each concept for each areal unit. Among the independent variables whose influence on fertility is to be determined, will be one or more that reflects inputs into the program either in terms of personnel, supplies, money, or some intermediate effect of such inputs, such as acceptance rates. The dependent variable will be a measure of fertility, and a method of multivariate analysis appropriate to the model and data is applied to yield an estimate of the relative impact of each independent variable. Typically, multiple regression analysis or path analysis will be employed. If a family planning

program has been effective, one expects a statistically significant, negative regression coefficient indicating that as inputs or acceptances increase fertility decreases.

As indicated in Table 1, multivariate areal analysis along with trend analysis and experimental design are the only techniques of evaluation that attempt to measure both program and nonprogram effects. Both trend analysis and experiments obtain a global estimate of all nonprogram factors, the former by inference from the preprogram trend in fertility and the latter by observing the change in fertility in the control areas. By contrast, multivariate areal analysis requires explicit measurement of all the demographic and socioeconomic variables thought to affect fertility, such as nuptiality, child mortality, education, and occupation; and it produces estimates of the net effect of each of these factors.

Though important questions concerning the impact of a family planning program can be addressed through areal multivariate analysis, a number of limitations should be noted. The technique is demanding of data, requiring a wide array of characteristics for a sufficiently large number of areal units. Also, the results obtained are likely to vary with differences in conceptual models, operational definitions, and techniques of estimation. In addition, many of the data sets and applications have been cross-sectional, and dynamic inferences about the amount of change in fertility associated with change in program inputs do not readily follow from such cross-sectional data.

Conclusions. This review of the major techniques in use for gauging the fertility effect of a family planning program has stressed the common elements as well as the points of difference. The differences include those of conceptualization, data required, and time referent, among others. This raises the question of whether different techniques applied to the same setting will yield similar inferences about the impact of a family planning program. Until recently there was little empirical data of this type, but under United Nations sponsorship a base of experience is accumulating. A United Nations report (1978) compares results from different methods in three countries, and a recent United Nations Expert Group Meeting reviewed data for an additional set of countries. The conclusion from these comparisons is that a major source of the differences obtained by alternate techniques is due to the measures of potential fertility employed. This hypothetical construct—the fertility that the general population or group of acceptors would have experienced in the absence of the program—remains conceptually and operationally one of the most difficult issues facing the evaluation of programs. Nevertheless, the experience developing from applications of several techniques to the same setting indicates that it is often possible to account

for discrepancies across methods and to identify the factors contributing most to the sensitivity of results. Moreover, for well-defined time referents it may be possible to establish reasonably narrow bounds for the number of births averted. Though considerably more work is needed, the outlook for obtaining reasonably accurate estimates of the effectiveness of a program is far from bleak.

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FAMILY PLANNING RESEARCH

Family planning research is broader than the evaluation of family planning programs [*see* FAMILY PLANNING PROGRAMS, *article on* MANAGEMENT AND EVALUATION]; the two overlap substantially, but family planning research examines a number of topics that are of interest outside the programs proper. It does not in fact have clearly fixed boundaries, merging at points with reproductive physiology, biometrics, and social science investigations. Its methods also range widely, and include life table appli-

cations, surveys, and field experiments. The organizing focus of the field is the understanding and control of human fertility as regards contraception, abortion, and sterilization.

Contraceptive Acceptance, Continuation, and Effectiveness. A convenient way to organize part of the field is along a continuum from contraceptive acceptance to its continuation and effectiveness. Information about acceptance comes largely from the records of large, private, family planning associations and the service statistics of large national programs. These give the basic counts of individuals accepting and also provide trend information on such personal characteristics as the age and family size of the acceptors. By tracing such information in a number of countries, it has been found that a nearly universal trend exists in large programs toward younger acceptors, with smaller family sizes, and that strong seasonal cycles often exist in acceptance rates. Data on such topics are compiled on a worldwide basis by Dorothy L. Nortman and Ellen Hofstatter (see Nortman and Hofstatter, 1980) and are extensively used both within individual countries and for international comparison, in spite of inconsistencies in the definition of "acceptor" and incomplete adherence to the expected definition at the local level. For example, acceptors may switch methods or move from one geographic area to another and be double counted, even when the intent is that each person be listed as an acceptor only once. In one country, for example, the raw reports of acceptors were adjusted downward by 20 percent to allow for various departures from the intended definitions.

Continuation measures have a lengthy history. Early efforts to compare contraceptive methods used the Pearl rate, which gives the number of accidental pregnancies per 100 woman-years of use. This method is easy to calculate and it is still used in medical settings for many trials of experimental contraceptive techniques. Its shortcoming is that it disregards the temporal factor: contraceptive use that falls close to acceptance may carry high termination risks, whereas use later, when many individuals for whom the contraceptive is unsuitable have dropped out, may carry low risks. Thus three hundred woman-years of use, all registered within the first calendar year after acceptance, can give a higher termination rate than three hundred woman-years of use taken from fewer individuals observed longer. If two contraceptives of equal value are studied, one in the first group and the other in the second, the second will be falsely judged as better. This problem arises whenever the risk of termination changes according to the number of months elapsed since acceptance.

In the early 1960s, therefore, the life table method [*see* LIFE TABLES] was applied to contraceptive trials. Entrance to the table is determined by contraceptive acceptance, with exit by termination of use for any reason, including accidental pregnancy. As with human mortality, the table traces termination month by month, or year by year, to show how the risk changes as time passes. Paralleling infant mortality, the risk of early termination may be especially high: the risk falls as the more vulnerable individuals leave the group. Whatever the time pattern, the life table method standardizes the termination rate by moving a cohort of acceptors through the months in sequence, stating the proportion having dropped out at six months, twelve months, and so on. In a multiple-decrement form, the table also allows for alternative routes of termination. For those who wear intrauterine devices (IUD's), for example, the alternatives are by expulsion, removal, or pregnancy with the IUD *in situ.*

With both the IUD and the pill, the curve for the proportion using the contraceptive, starting from the moment of acceptance, typically falls rapidly at first and then more slowly, in a pattern that was discovered to be closely represented by the formula $R = a/e^{rt}$, where R is the proportion of women continuing use at time t expressed in years, a is simply the proportion who avoid immediate terminations, r is a constant reflecting the annual rate of termination, and e is the natural logarithm base 2.71828. From this function it is easy to project an acceptor cohort forward through time to show the proportion continuing use at any point, and the total woman-months of use time up to that point can be determined. For example, if a is 0.90, t is set at, say, three years, and r is 0.2 (i.e., the termination risk is 0.2, which with instantaneous compounding will give 0.181 terminating each year among those who start that year), then R, the proportion using at the end of the third year, will be 0.494. The a and r values are derived from the actual life table, by a least squares fit.

This formula lends itself to valuable applications. It turns out that the mean use time is simply a/r; in the example, $a/r = 0.9/0.2$, or 4.5 years per person. Moreover, a female population in which 10 percent accept each year, with a mean use time of 4.5 years, will stabilize with exactly 45 percent using at any one time. Thus $P = AM$, where P is the prevalence level of 45 percent, A is the acceptance rate (10 percent), and M is the mean use time (4.5 years). Further formulas give the person-years of use in any interval, for example, during the second year alone, and related items; these appear in Nortman and Hofstatter (1978, p. 91).

Older concepts still employed in contraceptive research include "theoretical effectiveness," the protection afforded by a contraceptive under ideal conditions without human error, and "use effectiveness," which recognizes the errors committed under ordinary conditions of

use. Theoretical effectiveness, while not easily measurable, is suggested by that level of use effectiveness achieved by the most successful subgroups. A further concept is "extended use effectiveness," which measures the entire period from contraceptive acceptance to the first pregnancy including periods of both use and nonuse, as a more pragmatic measure for methods that are prone to intermittent application. A natural extension of this is to go from acceptance to the first birth ("demographic effectiveness") as a direct measure of the interval to failure in the sense of unwanted fertility itself. This application ignores any switching to different methods or sources of supply as well as any pregnancies ending in spontaneous or induced abortion.

Thus the essential life table method can be used to trace the entire aftermath of acceptance: the period to the first termination of the first method tried (labeled the "first segment"), or to the final termination of that method after repeated tries ("first method all segments"), or to termination after trying other methods ("all methods all segments"), or to pregnancy or birth. The variation used depends upon the investigator's purpose; the narrower definitions tend to assess the contraceptive method and the wider ones the program.

Life table applications are somewhat different for clinic data and for survey data from home interviews. Sources for the first, including detailed calculation methods, appear in a publication by Christopher Tietze and Sarah Lewit (1973); for the second in a work by Robert G. Potter (1969). Anrudh K. Jain and Irving Sivin (1977) clarify several features of life table work including the "lost to follow-up" problem, comparing solutions developed by Tietze and Potter with what is termed the "anniversary method."

"Contraceptive effectiveness" is now defined as the degree to which a contraceptive reduces the monthly probability of conception. If the monthly probability for a healthy cohabiting couple without protection is taken at .20, a contraceptive that reduces this to .10 is considered to have a 50 percent effectiveness. The IUD is about 95 percent effective, the pill perhaps 99 percent, so that the monthly probability is reduced to 1 percent and .2 percent respectively. These must be taken as approximations, since the 20 percent is difficult to estimate, as are other figures involved.

Survey Data Sources. Two quite different bodies of survey work have figured prominently in this field, commonly known as "client follow-up surveys" and "KAP surveys" (i.e., surveys of knowledge, attitude, and practice). The latter are often broader in coverage than family planning alone and may include questions about attitudes to national population growth, for example. In a few cases, where past and present clients of the program make up an appreciable share of the adult population, a single survey has served the aims of both, but this is uncommon.

Of the two types, the client follow-up surveys focus more strictly on the results of a program. Typically they relate to a sample of acceptors, who are interviewed at home to establish continuation rates and posttermination experience including pregnancy and abortion. Early surveys of this type showed continuation among acceptors in the general population to be discouragingly below the favorable rates registered by the select clinic groups used to test the IUD and oral contraceptive, and the surveys led to increases in national acceptor targets to compensate for the reduced continuation. These surveys have also afforded information on the sources of influence that led clients to the program, their satisfaction with the services rendered, alternative methods used after termination, and other topics bearing on the overall program effects of the individuals served. Client surveys, together with the analysis of clinic records, have provided the data for the life table continuation rates discussed previously.

KAP surveys relating to family planning have been extensively conducted since the late 1950s, with most developing countries now covered. These surveys usually sample households at large rather than clients and therefore do not sharply assess the program. It is of great interest for broad program strategy, however, to know the initial levels and subsequent time trends in the population's information about specific contraceptive methods, convictions about the desired number of children, government provision of services, and actual use of birth control methods. Moreover, many programs direct large information campaigns to the general population, and a series of surveys can trace changes in the items targeted for change. Information about a new contraceptive technique, such as the IUD and the pill in the early 1960s, or the injectable method later, as well as simpler techniques of sterilization, diffuses throughout a society by both program information and other sources, and it is important for program directors to follow this process. Finally, the same surveys are frequently used to measure fertility levels and trends, and these may bear closely upon program effects. Three major reviews of the KAP literature are available: two early ones by Bernard Berelson (1966) and W. Parker Mauldin (1965) and a more recent one by George T. Acsádi (1974), part of a broader bibliographic review related to the World Fertility Survey.

Other surveys are intermediate in character between the client follow-up and the general KAP survey. Special surveys have assessed the public information and education efforts of national programs, asking respondents what newspaper or radio messages they have noted or what program themes or slogans they recognize. Certain

topics may be investigated in any of these surveys, as for example, recency of contact with any program field-worker or distance to the nearest service point or contraceptive outlet.

Fertility Measures. In many developing countries the course of fertility is approximately known, although the sources of information are highly variable. Moreover, as with KAP surveys, the focus is not precisely upon the effect of birth control or of the program. Fertility rates respond to numerous influences, somewhat diluting their utility for the examination of any one determinant. Nevertheless, again as with KAP surveys, they are of great interest and are often the starting point for techniques that do isolate the program's own effect. [*See* Family planning programs, *article on* effects on fertility.] A measure as gross as the child-woman ratio [*see* Rates and ratios] has been used to reflect the rough course of fertility, though the crude birth rate is a more common starting point. Age-specific fertility rates for all women, or for married women, are used. Preacceptance and postacceptance fertility rates for acceptors, and sometimes for groups matched to them, have been employed. Needless to say, countries vary greatly in available data on each of these, and special techniques are often required to derive reliable estimates from defective data. [*See* Indirect estimation of fertility and mortality.]

Related Studies. Programs have been improved by a large variety of experiments and studies covering a range of topics too vast to summarize easily. A review of ninety-six projects (Cuca and Pierce, 1977a, 1977b) shows attention to the use of mass media, personnel, integration of family planning with other services, intensive efforts and sterilization camps, intensive payments to acceptors, and community-based distribution. [*See* Family planning programs, *article on* nonclinical programs.] The methods used in these studies have varied greatly in quality and in experimental character, from observational studies to quasiexperiments to a few classic designs. Another review (Ross et al., 1972), of research results rather than of projects, organized much of the knowledge of the field around these topics: acceptor characteristics, contraceptive continuation, mass communication, field-workers, paramedical personnel, lay workers and agent systems, mobile teams, postpartum programs, private sector, sterilization and induced abortion as special methods, and fertility change. A research group concerned with a variety of applied studies in the field, the International Committee for Applied Research and Population, focused on a similar listing, adding field trials of new contraceptives, incentives, and the special role of women. The common theme throughout most of this work has been that of special research to learn something new for application, and the lessons resulting have been incorporated to varying degrees in programs.

While much research in the family planning field addresses the needs of the individual country, considerable attention also has gone to international comparisons. Major technical analyses have been undertaken across sets of developing countries to determine whether program strength correlates with fertility decline (Freedman and Berelson, 1976; Mauldin and Berelson, 1978). Similar analyses have been done within geographic regions and within India using its states as units (Srikantan, 1977).

A special problem in this research has been the measure of program strength. To assess the independent effect of a national program it is desirable to measure its degree of strength rather than to list merely its presence or absence. As a first test, some have judged strength by acceptance rates; these show quickly the general magnitude of program activity, and for investigations of fertility change they are indeed a program input. They are also outputs, however, since they reflect prior determinants such as personnel and funding as well as such features as which methods are offered and how well dispersed the services are.

To capture a range of these inputs, and to express them entirely independently of acceptance rates, Robert J. Lapham and W. Parker Mauldin (1972) developed a fifteen-item index that has been used in several important studies of program effect. The starting point for the index was the concept that vigorous programs would tend to possess certain features: they would offer multiple methods, they would deploy a staff of field personnel, they would remove legal obstacles to contraception, they would maintain a continuous evaluation effort, and so on. The full list is as follows:

1. fertility reduction included in official planning policy
2. favorable public statements by political leaders
3. contraception readily and easily available, publicly and commercially throughout the country
4. customs and legal regulations that allow importation of contraceptives not manufactured locally
5. vigorous effort to provide family planning services to all married women of reproductive age
6. training facilities available and utilized
7. adequate family planning administration structure
8. full-time home-visiting field-workers
9. postpartum information, education, and service program
10. abortion services openly and legally available to all
11. voluntary sterilization services (male and female) openly and legally available to all
12. use of mass media on a substantial basis
13. government provision of substantial part of family planning budget from its own resources

14. record-keeping systems for clients at clinic level and for program statistics
15. serious and continuous evaluation effort

Subsequently some fifty-four country programs were rated on these fifteen criteria, and thirty others with no program were included to fill out a continuum on program strength. For each country, each criterion was scored from 0 to 2: yes, 2 points; qualified yes, 1 point; partially or no, 0 points. These ratings produced country scores ranging from 0 to 30, which provided four country groups: strong, 20 points or more; moderate, 10–19 points; weak, 1–9 points; and no program. This classification correlates well with both duration of program effort and with the demographic commitment in the country's population policy; for example, seventeen of twenty-six strong and moderate programs had announced specific demographic targets for growth reduction, versus only three of twenty-nine weak ones. It also correlates with acceptance rates, both as a fourfold classification and as a continuous variable in regression analyses.

Commentators on the index have emphasized the need to determine which of its fifteen items are most telling and the need to move toward objective ratings, relying less on judgments by experts. While the index has shortcomings, alternatives to it are not attractive. A program's budget is often a poor indicator of its strength; while some minimum budget is of course essential, large funding items may be included that have little to do with acceptance rates or fertility reduction. Indeed, the assessment of costs has posed severe difficulties (Robinson, 1976). Personnel information also fails to serve, as staff vary so greatly in character, ranging in some programs from semiliterate village workers to doctors in the central office, and from part-time to full-time. Thus, a composite index seems best, even though it contains some judgmental elements in important items that cannot at present be objectively measured.

Conclusions. Family planning research has produced a wealth of information along the chain of touch points from acceptance to continuation to posttermination experience to fertility change. Reasonably uniform information has been compiled on who is served by programs, that is, the personal and demographic characteristics of program clients, and on the relative performance of each major birth control method including sterilization and abortion. Much is understood about the comparative advantage, for fertility reduction, of younger acceptors, of those who have not previously practiced birth control, and of those in rural areas where private sources of assistance are scarce. Other topics are less amenable to research and are relatively neglected. Rather little is known as regards personnel effectiveness, training and supervision, or logistics and supply. These subjects are heavily concerned with process rather than output, and they tend to be examined, and decisions made, by observation and judgment rather than by formal research.

The question is frequently asked as to how extensively family planning research has contributed to program implementation. In a review devoted to the role of population research more generally, Mauldin (1977) examined this by topic, looking at the formulation of antinatalist population policies, experimentation with different types of personnel in family planning programs, the delivery of services, hospital postpartum programs, choice of contraceptive methods, planning that relates the number of acceptors to the degree of fertility reduction, and programs focusing on population redistribution and migration. Although precise linkages are often hard to document, examples from a number of countries and analysts support the conclusion that population research has been indeed useful to decision makers, planners, and program administrators, and that substantial contributions are still needed.

John A. Ross

For a discussion of methods of estimating prevalence of contraceptive use, see CONTRACEPTIVE USE, *article on* DEVELOPING COUNTRIES.

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FAR EAST

See ASIA; CHINA; JAPAN.

FERTILITY

"Fertility," in standard English demographic usage, refers to the actual reproductive performance, as measured in live births, of a woman, couple, or population. "Fecundity," on the other hand, refers to the physiological capability of an individual or couple to produce a live child, whether or not such capability is actually exercised. By contrast, the meaning of the terms "fertility" and "fecundity" is reversed from the English in French usage and in biology. "Fecundity" in that usage thus refers to actual live births and "fertility" to the ability to procreate.

Fertility together with mortality determines the crude rate of natural increase of a population. For calculation of fertility rates and ratios, see RATES AND RATIOS.

In this work numerous entries deal directly with aspects of fertility. FERTILITY AND DEVELOPMENT examines microeconomic and macroeconomic consequences and microeconomic and macroeconomic determinants of fertility. In FERTILITY AND MIGRATION, patterns of fertility among migrant women are reviewed. FERTILITY AND POPULATION GROWTH discusses the demographic impact of present and projected levels of fertility on contemporary and future growth.

FERTILITY DECLINE includes three articles: THEORIES attempts to explain fertility decline in both developed and developing countries; THRESHOLD HYPOTHESIS concerns a theoretical framework to link the demographic transition with social change and economic development; and EUROPEAN TRANSITION recounts the historical evidence concerning fertility decline in Europe. (See also EUROPE.) In FERTILITY DETERMINANTS two levels of determinants are reviewed: PROXIMATE DETERMINANTS deals with reasons for fertility decline, such as contraceptive use, while in SOCIOLOGICAL AND ECONOMIC THEORIES fertility is explained with regard to sociological and economic reasons for its status or change. Finally, in FERTILITY TRENDS the fertility of cohorts of women of the United States since 1917 is analyzed. In ADOLESCENT FERTILITY the fertility of teenagers in both developed and developing countries is discussed.

FAMILY PLANNING PROGRAMS examines the development of such programs, some of which have been organized with the policy intent of reducing fertility. The article on EFFECTS ON FERTILITY within the entry discusses evaluative methods for measuring these effects. FAMILY PLANNING RESEARCH covers methods for studying control of human fertility. Information on laws regulating fertility can be found in LAW AND FERTILITY REGULATION. Related entries are AGE AT MARRIAGE; BREASTFEEDING; and REPRODUCTION. For the contribution of fertility to population growth, see MOMENTUM.

FERTILITY, INDIRECT ESTIMATION OF

See INDIRECT ESTIMATION OF FERTILITY AND MORTALITY.

FERTILITY AND DEVELOPMENT

Since the 1960s, four principal analytical approaches to the relationships between population and economic development have emerged: (1) research on macroconsequences of fertility for development, (2) research on microconsequences of fertility for development, (3) research on macrodeterminants of fertility as affected by development, and (4) research on microdeterminants of fertility as affected by development. From a policy perspective, research on the consequences of fertility might be said to generate interest in the need for a population policy, and research on determinants to contribute to the optimal design of such a policy. Table 1 gives a classification and cites representative studies for each category. This classification is useful as a basis for presenting the analytical approaches, proceeding from macroconsequences and microconsequences of population growth and fertility to their macrodeterminants and microdeterminants.

Population growth was included in development models through the late 1950s and early 1960s. This work is in the "consequences" school—research and analysis that has focused on the consequences of rapid population growth for the economic development of nations. Chronologically this type of work came first and has significantly influenced both the policies of bilateral and international donors and much of the research on population growth and development that has succeeded it. It can be further categorized as "macro" work, because it uses aggregated economic and demographic information such as national birth and death rates, and dependency ratio, savings rates, and economy-wide production functions. Macroconsequences studies also apply the principles developed in these analyses to particular aspects of the economies of poor countries. In general, these studies conclude that in countries with high fertility rates, the net costs attached to meeting development objectives in

such areas as education, health, and employment could be significantly reduced by increasing expenditures on explicit programs to reduce fertility, specifically family planning programs.

Second is a body of work on the consequences at the family level, the microconsequences, of large numbers of children. Much of the relevant research in this area has been done by those in the medical and public health professions and by psychologists and nutritionists. The results of the work have only begun to enter the mainstream of economists' thinking on population-development relationships, although the framework for studies of the loss in human capital exists.

Third is the extensive and growing literature on the macrodeterminants and microdeterminants of fertility. This work has been most fruitful from theoretical and empirical points of view at the microlevel, with economists analyzing the costs and benefits of children to the household or family and with sociologists and anthropologists more explicitly concerned with the influence of local social and cultural norms.

Macroconsequences of Population Growth

After World War II, mortality rates declined dramatically and population growth accelerated in poor countries. If population growth had seemed to be directly related to economic progress in Europe and North America, it now seemed inversely related to the economic prospects of India, China, and Latin America. The situation in the postwar developing world is, of course, different in a number of significant ways from that of Europe when it was becoming industrialized. Governments in the postwar epoch must be more responsive to education, health, and even income standards for their populations. Today's developing countries must achieve growth in the face of the competitive products of another, already modernized group of countries. Most important, population in today's poor countries is growing at least twice as fast as it was in eighteenth-century Europe. The resultant age composition of the developing countries, with as much as half the population in the young, nonproductive ages, is much less favorable to production and proportionately more burdensome with respect to consumption and investments in social overhead.

TABLE 1. *Linking population and development*

	Consequences	Determinants
Macro	Coale and Hoover, 1958 Merrick, 1978	Mauldin and Berelson, 1978 Oeschli and Kirk, 1975
Micro	Wray, 1971 Birdsall, 1980	Rosenzweig and Evenson, 1977 T. P. Schultz, 1973

Macroeconomic Models. These unprecedented increases in population renewed the attention of economists to the rate of population growth. The analytic models of Richard Nelson (1956) and Harvey Leibenstein (1954) reintroduced population as an endogenous variable influenced by income. Their models are Malthusian: increasing income leads to increasing population growth rates; and, so long as population growth exceeds income growth, per capita income falls, resulting in a low-level equilibrium trap.

A seminal contribution to the analysis of the consequences of population growth was the work of Ansley J. Coale and Edgar M. Hoover (1958). Constructing a mathematical model of the economy of India, Coale and Hoover made projections of per capita income for India under low, medium, and high (exogenous) fertility assumptions. They concluded that over a thirty-year period, per capita income could be as much as 40 percent lower under the high compared to the low fertility assumption.

Over the years, many of the assumptions implicit in the Coale-Hoover analysis have been challenged. However, their study and the subsequent work on the macroconsequences of rapid population growth that it stimulated, are important in at least three respects. (1) This work reawakened economists and others to the demographic factor as a policy variable, whereas for some time population had been treated as a given in growth models. (2) It alerted those concerned with development to the importance of growth rates as well as absolute sizes of populations, making population an issue for Latin America and Africa as well as for the crowded countries of Asia. (3) It contributed significantly to the view, especially in the rich countries of the West, that other things being equal, extremely rapid population growth rates exacerbate development problems in the world's poor countries.

The Coale and Hoover book inspired a stream of economic-demographic simulations by others. Most of these were similar in assuming that fertility and mortality were exogenous factors, so that the economic changes induced by falling fertility had no feedback effect upon the vital rates themselves. Although projections of per capita income under different fertility assumptions vary substantially depending on the specific fertility assumptions, they consistently indicate higher per capita income under low fertility assumptions than under high. For example, among seven projections examined, per capita income was 10 to 15 percent higher after twenty years and 25 to 40 percent higher after thirty years under low-fertility assumptions than under high ones.

In addition there are some studies that project costs in such specific areas as education, health services, and absorption of labor into the modern sector, and there are descriptive essays on the consequences of rapid population growth for the balance of payments, the future supply of food, and the general availability of physical resources. For some of such problem areas the principal findings with regard to clarity of the presumed effect of population increases on the indicator (i.e., directness of the effect regardless of the roles of other variables), and strength of the presumed effect, including lag time before the effect takes hold and the relative importance of population growth compared to other variables, can be summarized as follows.

Education. Rapid population growth has a strong, direct effect on future expenditures on education. High fertility now almost guarantees more children entering the school system five years hence; and while a number of factors including rising wages of teachers and rising enrollment rates may increase educational outlays, an absolute increase in the number of students has been shown to be the single most important factor in increasing educational expenditures. Expenditures can be held down by increasing the ratio of students to teachers, decreasing the number of years students are enrolled, or decreasing enrollment ratios, but all these steps involve a decline in a country's per capita stock of human capital.

Health. Population growth similarly increases health costs. More people require more health services. High fertility rates have an immediate effect on costs of health services, since obstetric and pediatric needs constitute a substantial proportion of total demand for health services. On the other hand, the contribution of rapid population growth *per se* to the problem of inadequate health care should not be overstated. Where health systems are urban-oriented, are essentially curative rather than preventive, and do not serve the poor anyway, reforms in health care delivery (such as the much-discussed "barefoot doctor" system in China) might provide as much relief and improved health as an immediate reduction in demand as a result of lower rates of population growth. Unfortunately, systematic attempts to demonstrate how lower population growth rates would reduce expenditures on health care have not been matched by analyses of alternative ways to cut costs and maintain health services, so the true opportunity costs of rapid population growth to health care are unclear.

Labor absorption. Obviously, high fertility leads to rapid growth of the labor force, with a ten to fifteen-year lag between new births and new entrants to the labor force. Thirty-year projections for Sri Lanka, Chile, and Brazil indicate a doubling of the size of the labor force, even given "low" fertility, and an increase of as much as two-and-a-half times present size with "high" fertility. Furthermore, assuming a demographic transition to

lower fertility rates in ten to fifteen years, labor-force size then could be increased not only by the simple addition of today's current births at current rates of labor-force participation, but by an increase in the proportion of the population seeking work, as women with fewer births enter the work force at new, higher-participation rates. On the other hand, rapid labor-force growth leads to unemployment and poverty only under special assumptions: fixed capital-labor ratios in the modern sector combined with insufficient savings and investment and the inability of agriculture and the informal urban sector to absorb labor in socially productive activities. The deleterious effect of rapid population growth on the labor market could be mitigated if appropriate labor-intensive technologies were developed for production in the urban sector, if irrigation and other infrastructures permitting more labor-intensive use of land were created in agricultural areas, and if changes in the kinds of products and general development strategy (such as the growth of light-industry goods for export of South Korea and Taiwan) were available to all developing countries. Short of such adjustments, rapid rates of natural increase condemn a large portion of the labor force to low-productivity, low-wage jobs in agriculture or informal urban services.

Income distribution. High fertility among the poor in all countries, and in poor countries relative to rich, may exacerbate the problem of improving the distribution of income; however, there is little evidence on this relationship, and historically, improvements in income distribution have been more closely associated with other factors, economic, social, and political. The hypothesis that poverty associated with a skewed distribution of income also contributes to high fertility is discussed in more detail in the section on microconsequences of high fertility that follows.

Food, resources, and environment. Long-range projections of the supply of and demand for food are plagued by such unknowns as income changes, changes in agricultural technology, the heterogeneity of agricultural conditions throughout the world, and the political plausibility of redistribution. There is some evidence, however, that the rate of increase of population, if as rapid as in some areas today, increases the likelihood of "population overshoot," the outcome of which is "soil erosion in fields and overgrazed pastures to a degree that native plants cannot reestablish themselves after declining productivity results in abandonment" (Freeman, 1977, p. 41). Analysis of effects of population growth and development on the earth's carrying capacity requires collaboration of development analysts with geographers, ecologists, and others in the physical sciences; such effects, which will vary greatly by geographic location, are less

well explored and understood than the effects of population growth on education, health, and employment objectives. The indirect negative effects of technology that increases carrying capacity, such as the spread of river blindness and other water-borne diseases associated with the construction of dams for irrigation and power, have only begun to be considered.

Cost-Benefit Analysis. Implicit in those studies that introduce various exogenously determined fertility trends is the assumption that governments can use some form of external intervention to direct fertility trends along the path chosen. One posited intervention is the introduction or expansion of publicly subsidized family planning programs. A common approach of macroconsequences studies has been to compare the costs of a family planning program (which causes lower fertility) to the projected savings realized in health or education costs. Usually the savings in the latter are shown to "pay" for the former in this form of analysis. Such comparisons necessitate a host of assumptions regarding costs of launching family planning programs, acceptor rates, and the relationship between acceptor rates and actual births averted, as well as assumptions about future costs in health, education, or other areas, and about the society's welfare function, which may value children *per se* in addition to per capita goods.

The macroeconomic models and cost-benefit analyses of the 1960s have come under increasing criticism in recent years, directed both at their underlying assumptions and at the uses to which they have been put. Summarized, their assumptions include the following:

1. That household savings and public savings are a decreasing function of the dependency burden (ratio of consumers to producers) in the household and in the nation as a whole.
2. That social-overhead investment in, for example, education, health, and housing contributes less to growth in the short run than investment in directly productive activities and tends to occur in greater proportions in societies with higher dependency ratios.
3. That there is little room for adjustment in the capital–labor ratio in modern manufacturing and agroindustrial production, and that capital–output ratios are constant or increasing, so that high-fertility countries are condemned to specialization in labor-intensive products (chiefly agriculture), which often suffer from poor and deteriorating terms of trade.

Still, short of major structural changes in developing economies, the assumptions regarding savings are probably sound; the possibility of major changes toward more labor-intensive technologies is at best a long-term one; and the political and ethical need to increase the expend-

iture on social-overhead investments in proportion to population growth, irrespective of their impact on productivity, is obvious. As a result, the work produced in the 1950s and 1960s on the macroconsequences of rapid population growth for development has not yet been effectively challenged and has engendered a near-consensus on the excessive social costs of high fertility (with resultant rapid rates of population growth). It should be noted, however, that some critics of the macroconsequences work believe this to be a situation in which correct conclusions are sustained by faulty logic and misleading use of modern analytic procedures.

Policy Aspects. Macroconsequences research, beginning with the contribution of Coale and Hoover, has alerted planners to the costs of rapid population growth. Studies have been most fruitful in those areas in which the relationship between rapid growth of the population and increases in public costs is obvious, and in those areas that are themselves major development concerns: education, health, and labor absorption. Resource and environment problems and inequitable income distribution have less often been linked to rapid population growth, which may not be an important factor in these areas; also the causal links between them and population growth are complex and difficult to analyze.

But countries differ. Creating employment in the cities in Africa is of more immediate concern than exploitation of land resources; the opposite may be true in Bangladesh. Keeping up with educational needs of an expanding population is of high priority in Brazil; in Sri Lanka raising per capita food production is more important. Work on the macroconsequences of population growth must be carried out on a country-specific basis, and, often, it should focus on specific areas within the economy, as countries emphasize one or another development program.

Microconsequences:
Family Size and Family Welfare

A second category of literature on consequences of fertility concerns the detrimental effects of large families on maternal and child health and on child development. This field has been the domain of nutritionists, psychologists, and public health specialists. It has only recently been recognized by development economists as relevant for development and population policy. (See, e.g., World Bank, 1980.)

Although most studies of the microconsequences of family size have been carried out in developed countries, the implications of the results are probably even more important for developing countries. Almost invariably the magnitude of the adverse effect of large family size increases as family income declines; insofar as more families in poor countries exist at low-income levels, the aggregate effect of large family size on the health and capabilities of the population as a whole is greater.

A growing body of research in both developed and developing countries documents the health effects of family size on the child. In Thailand and Colombia, children from larger families are more likely to be malnourished (Wray, 1971). Studies in Great Britain, India, New York, and Hawaii demonstrate a positive association between the likelihood of a child's dying before the age of 5 and the size of the family into which he or she is born (Terhune, 1974). Although the effect is stronger in lower socioeconomic classes, it is also significant within classes. Research in Great Britain and Czechoslovakia indicates that children's height at given ages is associated negatively with family size (Terhune, 1974). In Scotland, France, and the United States, children from large families do less well in tests of intelligence, in studies controlled for social class; in Colombia, at given levels of family income, they are less likely to attend school (Birdsall, 1980).

Maternal health is also negatively affected by repeated and closely spaced pregnancies, especially among poor women. Although it is difficult to separate the negative effects of bearing many children from the increasing risks related to pregnancy at later ages, from a policy point of view the distinction may not be important for poor women who already have large families by the age of 30.

How is evidence of the adverse consequences of high fertility for families related to the socioeconomic development of a country? Consider the effects of family impoverishment on total output and on income distribution. A number of writers have examined the relationship between the quality of human capital and economic growth. Simon Kuznets (1966) argues that increases in the traditional inputs—capital, labor, and land—accounted for as little as 10 percent of the growth of the presently developed countries. The residual, or rise in output per unit of input, he attributes to improved quality of inputs or improved organizational and institutional arrangements. In his study of the U.S. economy, Edward F. Denison (1962) attributed 36 percent of growth in the period 1929–1957 to improvements in the quality of the labor force, presumably in part the result of better and more education. Theodore W. Schultz and his colleagues at the University of Chicago have documented the contribution that improvements in human capital make to economic growth in developed economies (1971); and Frederick H. Harbison called attention to the importance of human capital for development by entitling his 1973 book on the subject *Human Resources as the Wealth of Nations.*

The loss of individual potential as a result of malnutrition or lack of educational opportunity can be translated into losses for a nation because of lower aggregate levels of labor productivity and lower stocks of entrepreneurial ability and technological innovativeness. Some of these losses are impossible to quantify; we can only note the contribution such factors have probably made to growth in the West.

High fertility also exacerbates the inequality of income distribution among families. Less-educated and lower-income parents are more likely to have large families. Children from these families, even if they may come from a small proportion of all families (as in the richer countries or in countries with a more equal distribution of income) constitute a relatively large proportion of all children. To the extent that there are social or economic restrictions on upward mobility, the relatively more-rapid increase in numbers of the poor constitutes a drag on any income redistribution effort. This is particularly true if efforts are geared to increasing the distribution of opportunities, rather than redistributing income directly. A disproportionate share of poor children will come from the large families that are least able to respond to such opportunities. Among these families, early difficulties with providing adequate nutrition interact with later difficulties in supporting schooling.

Macrodeterminants of Fertility

Since the early 1960s, curiosity about the exact nature of the relationship between fertility and socioeconomic development has combined with the use of computers to inspire a spate of cross-national studies. These studies use multivariate analysis, an approach that, with the quantitative reach and precision of the computer, permits the researcher to observe simultaneously relationships between a dependent variable and a number of independent variables. In these analyses, some measure of fertility is estimated as a function of some indicators of the degree of a nation's development—the literacy rate, proportion of labor in agriculture, per capita gross national product, expectation of life at birth, primary and secondary school enrollment ratios, among others. A number of these studies of the macrodeterminants of fertility, the development indicators utilized, and the positive or negative relationship found between the indicators and fertility are compiled in Nancy Birdsall's work (1977).

Not surprisingly, certain indicators of advanced development are consistently correlated with low rates of fertility—high rates of literacy, high per capita consumption of energy, high rates of urbanization, low rates of infant mortality, high per capita income. And government support for a family planning program, which is in part the result of socioeconomic progress in developing countries, can add to the influence of such progress in reducing fertility (Mauldin and Berelson, 1978).

But there are difficulties in the interpretation of such results. The results of a cross-section analysis, which takes a picture of different countries at one point in time, do not necessarily mirror what has occurred within countries or what will occur over time. Multivariate analysis in which trends in fertility have been estimated as a function of trends in several socioeconomic indicators across countries have been less successful in accounting for fertility change. And several historical studies of the fertility decline in parts of eighteenth-century and nineteenth-century Europe have led scholars to conclude that diffusion of the idea of family limitation within cultural and linguistic subareas was more important to birth rate declines than any particular socioeconomic indicator or set of indicators. [*See* FERTILITY DECLINE, *article on* THEORIES.]

A second difficulty with the macrodeterminants approach is that it cannot elucidate the specific mechanisms through which changes in gross indicators over time, or differences in gross indicators across countries, influence the fertility behavior of individuals. Because higher levels of education and greater consumption of energy are associated with lower fertility, we cannot conclude that more classrooms and more lightbulbs will cause lower fertility, or know, if they do cause lower fertility, exactly how. In this sense, it is actually a misnomer to use the term "determinants" in referring to these studies. Better understanding of how individual fertility decisions are influenced by environmental changes (which the changes in the gross indicators imply) requires analysis of data collected directly from individuals, that is, microdeterminants research. This research uses census and survey data including information on characteristics of individuals—education, occupation, residence, desired or actual number of children, and so on.

Microdeterminants of Fertility

Studies of individuals and households generally follow one of several conceptualizations of the fertility decision—the economic model, the psychological model, or the sociological model. The economic model explains changes in household fertility as a function of changes in the family's economic situation attendant upon socioeconomic development. The objective is to explain by one model both the dramatic growth of populations in developing countries and the equally dramatic, large-scale control of fertility in the developed countries.

This approach, sometimes called the "new home economics," treats the child as both a produced (investment)

and a consumer good (T. W. Schultz, 1974). Fertility is the result of rational economic choice within the household. Children, or more properly "child services," are consumed by the household; and because children are assumed to be noninferior goods, increased income increases the demand for them. Child services are also produced in the household, through inputs of parents' time and goods bought in the market, such as housing, formal education, and health services. Children may also be an investment, short-term if they work during their childhood, long-term if they support parents in old age.

If increased income increases the demand for child services, how do the new home economists explain the apparent fact that fewer children are "purchased" by high-income couples in high-income societies? There are two answers. First, though the income effect increases demand for children, the price or substitution effect reduces demand by increasing the price of children relative to other goods, inducing high-income couples to substitute other goods for children. The price effect operates chiefly through the increasing opportunity cost of the mother's time as women increase their educational attainment and employment opportunities. Second, with increasing income, parents opt for "higher quality" children rather than greater quantity, devoting more of their own time and income to children's health and education. That explains the use of the term "child services"; the demand for more child services can be satisfied with fewer but higher-quality children.

Economic development increases the costs of children by increasing the value of parents' time and the costs of education, health, and housing, at the same time it reduces the benefits of children, as they work less in the market and as institutional forms of old-age insurance substitute for support by children. By this approach the new home economics of the family explains the apparent link between economic growth and the so-called demographic transition.

This economic model thus concludes that for poor families in developing countries, children entail low net costs and, in the extreme case, may actually be a net benefit. In the extreme case, parents would have as many children as they could and have a finite number of children only because of "supply" constraints: limited fecundity and high fetal and infant mortality (Tabbarah, 1971). The rationale for high fertility among poor families may be strengthened by high rates of child mortality if parents in high-mortality communities insure themselves against possible child loss by having more children than they would want. And for poor families, the costs of procuring modern contraceptives or using traditional ones can be high relative to the low costs of raising children. (World Fertility Survey results indicate that in

many countries family planning services are not available to the poor, particularly in rural areas.) In other words, complementing the concept in the macroconsequences literature that high fertility entails a high net cost to poor societies is an explanation in the microdeterminants literature that large family size entails low net costs or even a net benefit to individual poor families. This theoretical gap between the low private and high social costs of children in developing societies has been a principal justification for invoking government programs.

Two relatively new streams of research are relevant in this context. The first seeks to broaden the notion of the household as the unit of choice. The new home economics of the family assumes that the household has a common utility function with respect to children. Yet husband and wife need not always be in accord regarding children. Furthermore, even if parents are in agreement in wanting many children, children themselves may prefer few siblings. Parents, who are merely this generation of decision makers, may be better off with large families because they are able to exploit their children. When the children themselves grow up, the process is repeated.

A second recently evinced concern is to go beyond the household as the unit of choice and to analyze fertility decisions within the context of the community in which individuals participate or of the clan or other unit that impinges on their behavior. Geoffrey McNicoll (1975) has called attention to the way communities can export the costs of their own rapid population growth through out-migration. Few existing studies address such questions as whether villages with different levels of services—schools, roads, health clinics, family planning services—or different cropping patterns, or different arrangements for the physical security of citizens, or different norms with respect to obtaining jobs for relatives, have different patterns or levels of fertility. The apparent success of fertility reduction efforts in China, where programs are grounded in community-level incentives, and in Indonesia, where family planning programs are based in villages, partly explains recent interest in examining the effect of community social structure and norms.

Conclusions

Research relating population and development demonstrates that extremely rapid population growth rates can exacerbate development problems. Even skeptics seldom question that population growth has implications for capital accumulation, employment levels, income and its distribution, public expenditure on social services, and food availability. Studies of the consequences of rapid growth of population for education, for health, for

labor-force absorption, and for progress in other problem areas complement the results of the more general models. Moreover, at the microlevel, children from poor families that are also large are doubly burdened; resources for health and education are more limited in their households.

Careful analysis of the determinants of household fertility, however, also indicates that high fertility rates are not an inexorable component of underdevelopment; there are policy interventions to reduce fertility that could be, and have been, effective at tolerable cost. Reduction of infant mortality appears to be a natural prerequisite to reduction of fertility. Research on fertility determinants points to the critical role of female education in reducing fertility. Improvements in opportunities for women to work, under certain conditions, can hasten fertility decline. Any success in increasing incomes of the poorest groups is likely to result in the benefit of reduced fertility; this includes increasing availability of services in health and education to those groups. There is considerable room for expansion and improvement of family planning services, and in particular for efforts to bring such services to the poor. No one intervention can be expected simply to lower the fertility rate; the relation between each variable and fertility is complex, as are the relations among these variables and their joint effect on fertility.

Nancy Birdsall

See also FERTILITY DECLINE, *article on* THEORIES; FERTILITY DETERMINANTS, *article on* SOCIOLOGICAL AND ECONOMIC THEORIES; POPULATION AND DEVELOPMENT.

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FERTILITY AND MIGRATION

Some declines in fertility as a consequence of migration from rural to urban areas are expected and indeed have been observed. The probability of this reduction is influenced by a wide range of variables, including the characteristics of the migrant woman and her experiences in the urban setting. Theoretically, cultural and socioeconomic variables determine *desired* family size; actual fertility

behavior is almost completely determined by four proximate variables—marriage patterns, contraception, lactation, and induced abortion (Bongaarts, 1978). It is through these proximate variables that socioeconomic changes resulting from migration have their effects. Evidence on the expected migration-related fertility change is reviewed here within the context of a generalized socioeconomic model for fertility decisions. Most of the evidence cited here is drawn from developing countries.

The Easterlin Model for Fertility Decisions. Richard A. Easterlin (1975) has developed a generalized model for fertility decisions, according to which a woman varies her childbearing in order to optimize her household's utility. Her decisions are affected by the following concerns:

1. *Income.* To the extent that children increase household income, large families are favored. Yet the net effect on income does not depend solely on the children's monetary contribution. It also depends on their time contributions and other contributions that allow other household members to increase household income.

2. *Price.* If children are costly, there will be an incentive to limit childbearing. A major component of the price of children is the opportunity cost of the mother's time spent on childrearing exclusive of other income-generating activities. The more time a woman must devote to childbearing and the higher the level of foregone income, the less likely she is to favor a large family. The other major component of price are expenditures on children, especially for education. If the household prefers to invest heavily in child "quality," the household is expected to opt for fewer children, demonstrating the widely anticipated child quality-quantity tradeoff or "tastes" effect.

3. *Costs of regulation.* Fertility limitation may not be a "free good." In order to regulate fertility, a woman must possess information about and the actual means by which to regulate births; if the costs associated with obtaining these items are high, fertility regulation will be less likely. Likewise, fertility regulation may be associated with certain social costs, such as loss of prestige, parental disfavor, or other social sanctions against women or couples that do not have as many children as expected. Thus, the "costs of regulation" include the costs of not upholding the familial or cultural norms regarding childbearing.

Correctly identifying the effects of migration on fertility requires examination of the net effects via the proximate variables and, indirectly, the income, price, and costs of regulation variables.

Identifying Linkages. The theory regarding migrant fertility assumes that migrants earn more in the cities than in their rural places of origin. This higher income is supposed to raise the "price" of children, thereby producing a decline in fertility. In addition, migrants are expected to adapt and become more like native city dwellers. Urban-born women generally have fewer children than rural women, thus migrant fertility is expected to fall, approaching urban fertility levels. Fertility reductions consequent to migration do not universally occur, however. Some studies find at best a weak negative relationship between geographic mobility and fertility, while others observe no appreciable difference.

There are several potential methodological causes for discrepancies in the evidence on the magnitude and direction of effect of migration on fertility.

1. *Different comparisons.* Some studies compare rural-urban migrants to native city dwellers, while others contrast them with rural nonmigrants.

2. *Failure to control for age at migration.* If migration occurs late in the childbearing years, there is less chance for migration to affect fertility.

3. *Assumption of homogeneous populations.* Obviously there is great variation in childbearing among the urban and rural populations, and much of this variation is due to socioeconomic or age differences. Valid assessment of the migration consequences requires comparison of similar populations. Likewise, not all migrants to cities have come directly from rural areas. If the fertility effects of rural-urban migration are to be evaluated, the sample should be limited to rural-to-urban migrants.

4. *Incomplete specification of the migration-fertility relation.* According to the model presented earlier, it is necessary to specify the potential migration-related fertility changes as a function of changes in the proximate variables, which in turn are a function of migration-related changes in the socioeconomic variables. Migration analyses do not always allow for this causal sequence and sometimes bias the effects by failing to include all its elements.

5. *Equation of modernization and urbanization.* Some analyses have been based on the assumption that anyone living in a city is subject to modernizing influences. Researchers have shown that this is not so, that many migrants continue in traditional life styles, substituting subsistence work of an informal nature for the subsistence farming of the rural area.

6. *Inappropriate assumptions about migrant household structure.* Migrant women are not a homogeneous group. One cannot assume that all migrant women are married and make fertility decisions with a spouse.

7. *Static assumptions about migrant characteristics.* The fortunes of migrants may rise or fall after arrival in the

city. If income or the other Easterlin variables have changed since arrival, then comparisons of present socioeconomic characteristics with present fertility may be spurious.

Hypotheses Regarding Migrant Fertility. Eight hypotheses regarding migrant fertility have been advanced by various researchers.

1. *Fertility reduction is more likely for younger women.* If a women is nearing the end of her childbearing years, migrating to the city has little effect on her fertility. But because most migrant women are in the peak childbearing years they have the possibility of reducing their fertility (Goldstein, 1973).

2. *Fertility reduction occurs because marriage is delayed.* Migration may be a factor in causing women to delay marriage or to experience lengthy separations from their spouses. Such delays and separations can cause a reduction in the birth rate. However, higher age at marriage or lengthy separations are often related to educational or occupational level, which also affect fertility and family size.

3. *Migrants have lower fertility because they are better educated and take advantage of urban opportunities.* Numerous studies have shown that education is one of the principal determinants of fertility (Cochrane, 1979), and empirical results generally support the hypothesis that educated migrants have lower fertility (desired or achieved) or use contraceptives more frequently than do uneducated migrants. In San Juan, Bogotá, and Mexico City, for instance, migrants who had completed primary school were roughly twice as likely to use contraceptives as migrants who had not completed primary school (Stycos, 1978).

It is important to understand how education may produce fertility declines. Education itself does not reduce fertility. Education is inversely related to fertility because it raises the price of children and lowers the cost of regulation (Cochrane, 1979). Education has a stronger inverse impact on fertility in urban than rural areas because women with modern aspirations often move to town. Once in the town, other factors relating to education operate on the woman's aspirations and decisions. Also, if postprimary education opportunities are available only in urban areas, a stronger correlation between education and delayed age at marriage will exist in urban areas than in rural areas.

4. *Migrant women have lower fertility if their jobs are incompatible with child-care responsibilities.* Migrants are positively selected for education, often correlated with increased labor-force participation. Given sizeable urban-rural differences in employment opportunities for educated persons, it is reasonable to expect that migrants

are more likely to find opportunities using generalized knowledge in cities. Thus, for educated migrants, the following set of fertility-related influences is expected: (1) education increases the probability of finding a job; (2) jobs for educated persons pay more than for uneducated persons; (3) migrants earn more than those who stayed home; (4) the "income" effect increases demand for children as "consumer durables," leading to higher fertility; (5) the "price" effect will offset the income effect if the educated migrant is a woman who cannot keep children with her at work and cannot find family or friends to care for children.

Some studies of labor-force participation and fertility, not always explicitly concerned with migrants, find a strong inverse relation, while others find little or no relation (Findley, 1977). To deal with these inconsistent findings, researchers postulate that fertility falls if women work at jobs incompatible with the housewife role, such as white-collar and live-in domestic work. But even role incompatibility is not a sufficient condition for a fertility decline among working women (Hass, 1974). Instead, the critical variables associated with lower fertility among urban women are perception and approval of nondomestic roles for women. More education is correlated with this approval, hence education is the key factor responsible for the development of this attitude.

Effectively, this reinterpretation of the role-incompatability theory shifts the education-migrant fertility linkage away from the labor-force price effect toward its companion "tastes" effect. Income and work responsibilities outside the home are *not* sufficient conditions for fertility reduction among educated migrants. The migrants' attitude, associated with their education, is also important.

A variant of the income-effect theory relates fertility to the husband's occupational status and mobility. The fertility differential seems most marked between agricultural and nonagricultural occupations, which implies that shifting occupations will reduce migrants' fertility. Although many studies offer support for this theory, there is opposing evidence. In Puerto Rico and Nigeria, for example, the wives of the highest-status workers have higher fertility than the wives of middle-status workers, perhaps because women at the highest income levels can afford servants to care for children (Macisco, Bouvier, and Weller, 1970; Caldwell and Caldwell, 1976). In some instances, the husband's occupational mobility is related to a desire for smaller families. In a sample of urban, white-collar, upwardly mobile male clerks in Ghana, desired family size is lowest for migrants (Oppong, 1976). However, optimism generated by rising incomes also can result in higher fertility, a relation documented in Honduras and several other nations (Nance and Thomas, 1971).

The findings generally suggest that if education has a positive impact on fertility via the income effect, it will be through the husband's occupation.

5. *Migrants are more likely to limit their births if they have modern aspirations for their children.* A major education-fertility linkage is the development of modern aspirations for the migrants or their children; these aspirations translate into schooling costs, thereby raising the price of children. The aspiration effect is likely to be even stronger for rural-urban migrants, because the migrants often leave rural areas in order to actualize their hopes and dreams. In the Philippines, for example, the more-educated migrants are rural-urban migrants. They are more innovative and have higher aspirations than the less-educated, rural-rural migrants. After controlling for age, the more-educated rural-urban migrants have smaller families than the less-educated, largely because they stop childbearing at an earlier age (Hiday, 1978).

Education is also more likely to result in pursuit of an urban life style, which may include adoption of modern attitudes, including favoring small rather than large families. The important thing to note here is that modern attitudes, not necessarily modern behavior, correlate with approval of smaller families (Miller and Inkeles, 1974).

6. *Migrants who interact with groups who have low fertility norms are more likely to desire smaller families.* Distance from family and friends raises the cost of interaction, and, although bonds will be maintained, they will necessarily be of a different nature. Migrants will increasingly build a social network involving residents of their place of destination. Although some scholars expect migrants to experience *anomie* and isolation, there is substantial evidence that migrants not only maintain but also develop new supportive social relationships.

The urban environment contains a more diverse population, including subcultures that could not survive in small towns or rural areas. Accordingly, migrants to cities are more likely to meet, interact with, and establish relations with persons unlike themselves.

Among the uncertainties that prevent adoption of small-family norms are safety and effectiveness of contraception, expected infant mortality levels, level of children's labor inputs, and support for old age (Schnaiberg and Reed, 1974). If migrants meet women who have small families they will have more opportunities to assess the consequences of small families and to reduce the sense of uncertainty or risk associated with a life with fewer children. This can reduce the perceived cost of regulation, as well as lead to a price effect via changes in attitudes.

Because urban fertility levels are generally below the rural levels, the simple probability of encountering women with small families is higher in the city. But if migrants are to perceive the consequences, brief encounters are not enough to influence fertility. The encounters must be lengthy, repeated, and varied. In short, this means living near or working with such women. David Goldberg's analysis of Mexican and Turkish migrants (Goldberg, 1976) demonstrates this relation. Those who live in a relatively homogeneous neighborhood with people of the same residential background and characteristics have experienced much less change in their childbearing patterns than those who live in more diverse neighborhoods.

Ethnicity can influence the degree to which migrants become involved with and accept new "reference" groups. Childbearing among some groups is tightly ruled by cultural traditions that are relatively unchanged by migration. That is, the migrants whose culture traditionally expects compliance with a rigid set of norms may continue that compliance regardless of residential context. Studies in Cameroon and Canada have demonstrated the mediating influence of culture on migrant fertility responses (Clignet and Sween, 1978; Beaujot, Krótki, and Krishnan, 1978).

7. *Migrant women will have fewer children if they experience fewer infant or child deaths.* In societies where postpartum amenorrhea and voluntary abstinence while nursing constitute major impediments to high fertility, any shortening of either period may lead to an earlier exposure to the risk of pregnancy, thus to more frequent births. Traditionally, rural areas have had higher infant mortality, contributing to higher fertility in the country than in the city.

But lower urban infant mortality levels do not necessarily lead to lower urban fertility. Urban mortality declines may not result in proportional fertility declines if city women do not uphold sex taboos while nursing. Also urban women tend to nurse their children for a shorter period of time, thereby reducing the period of amenorrhea. Finally, if the urban mother supplements or replaces her breast milk with a formula, the probability of lactation-induced amenorrhea is much lessened. In addition, not all migrant women experience lower infant mortality. For many rural-urban migrants, clean water and a sanitary disposal system are no more accessible than in their home villages, therefore infant mortality may be the same or higher than in rural areas. In Lima, Peru, migrant women who had experienced at least one child death had significantly more live births than women who had experienced no deaths (Frisancho, Klayman, and Matos, 1976).

8. *Migrant women will have fewer children than rural women because the migrants are selected for low fertility expectations prior to their migration.* According to some researchers, the observed rural-urban migrant fertility

differentials are entirely the result of the fact that migrants were selected for lower fertility expectations *prior* to migration (Hendershot, 1976). It is hypothesized that the migrant women with lower fertility after moving are simply those who, by virtue of their age, education, skills, or resources, would also have had smaller families in the rural community. Studies in the Philippines, Thailand, and Honduras support this "selectivity" hypothesis (Findley, 1977).

Yet support for the selectivity hypothesis is not uniform. Several researchers have shown that *after* controlling for the selectivity factors, migration status or place of residence is a significant variable (Anker, 1977; Hendershot, 1976). In other words, there is evidence that cities or migration status itself exert an *additional* fertility-reducing effect above and beyond migrant selectivity. This effect has variously been called the "adaptation effect," the "effect of place variables," "contextual" effects, and so on. The effect can be additive or interactive.

Thus migrant fertility differentials appear to result from the joint effect of individual and contextual differences. Both selection and adaptation operate to reduce migrant fertility.

Summary. The evidence reviewed here suggests that migrant women will desire or have smaller families after moving if they (1) are young at time of migration; (2) delay marriage or first union, (3) experience lower infant and child mortality in conjunction with continued lactation and abstinence or use of birth control methods, (4) have or obtain literacy skills, (5) have aspirations for themselves or children, (6) interact with reference groups supportive of small families, (7) are committed to work outside the home and in a nonhousewife career, (8) are less reliant on children for help and plan more investment in children's education and support, (9) are part of a culture with an openness to modernization and change, and (10) are aware of and can obtain contraceptives.

Of all the factors that are likely to result in fertility declines among migrants, education for migrant women is probably the most critical. Through education and residence in the city a migrant women is more likely to develop a desire to limit births and to evolve into a situation where such limitation is feasible, supported, and economically advantageous. But the relation between migrant education and fertility reduction is complex; many circumstances, such as cultural norms, can alter the magnitude and direction of education's effect. This is not to say that migrant women with little or no education will not have smaller families than if they had not moved. Without the advantage of literacy, however, the chances are much smaller, since several of the urban contextual effects operate most strongly for those with education.

Sally E. Findley

See also FERTILITY AND DEVELOPMENT; FERTILITY DETERMINANTS; INTERNAL MIGRATION; URBANIZATION, *article on* DEVELOPING COUNTRIES.

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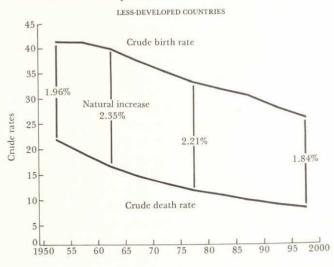
FERTILITY AND POPULATION GROWTH
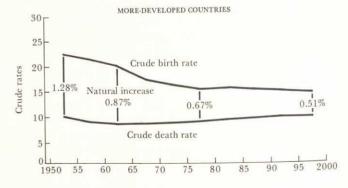
The crude birth rate of the world was about 36 births per 1,000 population per year in 1950; it has been reduced by about 20 percent during the past thirty years and is below 30 today. The more-developed countries, which now have one quarter of the world's population, had moderately low fertility in 1950, an average crude birth rate of about 23. There has been a remarkable decline in fertility in almost all developed countries during the past three decades. The average decline has been about one-third (34.1 percent), and the level of crude birth rates today is about 16 (see Figure 1). A few of the developed countries have more deaths than births (e.g., both East and West Germany), and many have rates of reproduction that if continued would result in no growth or negative growth. The average rate of growth of population among these countries is well under 1 percent, and it is likely to decrease further during the next few decades. Thus, population growth among the more-developed countries poses few problems in terms of maintenance of current levels of living, but there are many problems of urbanization and distribution.

The developing countries present a different picture. In 1950 their populations numbered 1.7 billion, and death rates were high, more than 23 per 1,000. The revolution in mortality has reduced the crude death rate al-

FIGURE 1. *Percent of natural increase, 1950–2000, United Nations medium assumptions*

LESS-DEVELOPED COUNTRIES

MORE-DEVELOPED COUNTRIES

most by half to 11 or 12. Fertility was high in 1950, about 42 per 1,000. Thus, the rate of growth was slightly less than 2 percent per year in 1950. Major changes in fertility have also occurred in many developing countries, though overall fertility changes have been less marked than the decline in mortality. The figures show a decline in the crude birth rate from 42 to about 33, a decrease of 9 points, or about 20 percent. Changes in fertility have been dramatic in Asia and the Pacific, substantial in Central and South America, and hardly noticeable in Africa. In Asia, where the bulk of the population lives, the crude birth rate declined by 25 percent from more than 41 to 31. In the Americas the decline was about 16 percent, from more than 41 to less than 35. The data for many African countries are woefully inadequate, and both levels and trends of rates may not be accurately reflected in the figures available, which suggest a crude birth rate of about 48 in 1950, and perhaps dropping a couple of points to 46 in 1978. Only two countries in Africa, Tunisia and Mauritius, have had appreciable changes in fertility over the thirty-year period. Egypt had a decline in its crude birth rate in the late 1960s and very early 1970s, but since that time the crude birth rate increased to 41 in 1979, about the same level as in 1965. Most of the changes in the crude birth rates of Egypt are attributable to changes in the number of persons marrying; a small part of the change is the result of a modest decline of 7 to 8 percent in marital fertility from the mid-1960s to the mid-1970s.

Developed Countries. All developed countries experienced fertility declines from 1950 to 1978 with the sole exception of Argentina and Ireland. Declines ranged from about 15 percent in Spain to more than 25 percent for twenty-five countries (Table 1). Overall, fertility declined about one-third (34.1 percent) in developed countries. Decreases in fertility rates were common to large and small countries, to capitalist and socialist societies, to European and non-European populations, to Catholics and Protestants.

The current levels of fertility are remarkably low for almost all of the developed countries. West Germany has a birth rate of less than 10, well below the replacement level, and thirteen additional countries have rates of less than 15. These are Sweden, Austria, Switzerland, Luxembourg (less than 12); Denmark, the United Kingdom, Belgium, Italy, the Netherlands, and Norway (less than 13); Finland, France, and East Germany. All of these countries plus Canada, the United States, and Japan have below replacement levels of fertility. Indeed, the fertility level for all developed countries is barely at replacement level.

A few developed countries do not have low fertility. Albania, with a crude birth rate of 33 when last reported,

and Israel and Argentina, with rates of 25, are the major exceptions. Ireland and Uruguay also have crude birth rates above 20. All other developed countries have crude birth rates of 20 or less.

The pattern of decline in fertility rates in developed countries has not been uniform during the past thirty years. For example, fertility rose dramatically in the United States from 1950 to 1957, declined relatively slowly until about 1965, then declined more rapidly for several years, and has been level at a crude birth rate of about 15 for seven years. In general, fertility declines were more rapid during the 1960s than during the 1950s. Given that fertility rates are so low in most of the developed countries, one would expect further decreases to be small, and in some instances fertility is likely to rise. But the expectation is that once low rates have been attained they are likely to remain relatively low, with perhaps occasional upsurges.

While major developing countries are seeking to reduce their birth rates, a small number of developed countries, chiefly in Eastern Europe (where legalized abortion came to be associated with, or indeed produced, a quite low birth rate) are making determined efforts to increase theirs, with occasional signs of success. Both negative and positive means are used in an effort to increase fertility. Negative measures include tightening of restrictions relating to induced abortions and reduction in the availability of contraceptives. Positive measures are a liberal increase in monthly wages for couples having three or more children and interest-free loans for purchase of an apartment or house and household furnishings, with, for example, 20 percent of the loan being cancelled at birth of the first child, 30 percent for the second child, and the remaining 50 percent for the third child, if born within eight years. Measures such as these are made available in Czechoslovakia, East Germany, Bulgaria, Hungary, and Romania.

In addition, a number of other developed countries have pronatalist ambitions or milder policies or both: Israel, for obvious political and ethnic reasons; France, with a target since 1975 of attaining replacement fertility or slightly higher; Finland, with quantitative targets to prevent a decline in population in any of its counties; Greece, with a target of ensuring a population growth rate not much lower than 1 percent per year; Argentina, with various pronatalist measures such as cash subsidies and housing and medical benefits. The Netherlands reports the goal of achieving a stationary population, and Japan reports that a stationary population is "estimated and expected."

Developing Countries. There are ninety-two developing countries with a population of a million or more, but 2.6 billion, or 80 percent of the population of all develop-

TABLE 1. *Crude birth rates and percentages of change, 1950–1978, in selected developed countries*

Country	1980 population (thousands)	Crude birth rate		Percentage change in crude birth rate
		1950	1978[a]	
The Americas				
Canada	24,073	27.1	15.3	−43.5%
United States	227,158	23.5	15.8	−32.8
Subtotal	251,231	23.8	15.8	−33.8
Asia and the Pacific				
Australia	14,487	23.3	15.7	−32.6
Israel	3,950	34.7	25.2	−27.4
Japan	116,364	28.2	14.2	−49.6
New Zealand	3,268	25.9	16.9	−34.7
Subtotal	138,069	27.8	14.7	−46.9
Europe and the Soviet Union				
Austria	7,481	15.6	11.5	−26.3
Belgium	9,920	16.9	12.4	−26.6
Bulgaria	9,007	25.2	15.5	−38.5
Czechoslovakia	15,336	23.3	18.4	−21.0
Denmark	5,105	18.7	12.2	−34.8
Finland	4,818	24.5	13.5	−44.9
France	53,450	20.7	14.1	−31.9
Germany, East	16,864	16.9	14.0	−17.2
Germany, West	60,903	16.5	9.5	−42.4
Greece	9,329	20.0	15.7	−21.5
Hungary	10,761	20.9	15.0	−28.2
Ireland	3,307	21.3	21.7	1.9
Italy	56,959	19.5	12.5	−35.9
Netherlands	14,083	22.7	12.5	−44.9
Norway	4,080	19.1	12.6	−34.0
Poland	35,805	30.7	19.0	−38.1
Portugal	9,856	24.4	16.8	−31.1
Romania	22,268	26.2	19.1	−27.1
Soviet Union	266,666	26.7	18.1	−32.2
Spain	37,378	20.2	17.2	−14.9
Sweden	8,262	16.5	11.6	−29.7
Switzerland	6,310	18.1	11.3	−37.6
United Kingdom	55,888	16.5	12.3	−25.5
Yugoslavia	22,328	30.2	17.2	−43.0
Subtotal	746,164	22.5	15.5	−31.8
Total	1,135,464	23.4	15.5	−34.1

[a]The latest available figures for Romania and Spain are for 1977.

ing countries live in only sixteen countries. Population data, crude birth rates, and percentage changes for 1965 and 1975 are given for fifteen of those countries in Table 2 (reliable vital statistics are not available for Vietnam). Together the listed countries contain a population of more than 2.5 billion, more than half that of all the world, and 78 percent of the developing world. These countries vary enormously in ethnic origin, culture, level of development, population policy, and changes in fertility. Brazil and Nigeria do not seek to reduce the rate of population growth, but in recent years they have

adopted policies of supporting family planning for reasons of health and as a human right. Iran had a policy to reduce its rate of population growth, but it is unlikely that the present government will continue that policy. Burma has a pronatalist attitude. It recognizes family planning as valid on maternal and child health grounds, but contraceptives are not easily available. Their import is illegal and family planning clinics are not allowed. All the other countries have adopted policies to reduce the population growth rate.

There has been no significant reduction in fertility in

TABLE 2. *Crude birth rates and percentages of change, 1965–1975 (or later), in less-developed countries with populations of 35 million or more*

| Country[1] | 1980 population (millions) | Crude birth rate | | Percentage change in crude birth rate |
		1965	1975 (or later)[2]	
China	975	34	20[8]	−41%
India	694	43	36	−16
Indonesia	152	46	36	−22
Brazil	122	42	33[7]	−21
Bangladesh	89	48	48	*
Pakistan	82	47	47	*
Nigeria	77	49	49	*
Mexico	70	44	37[8]	−16
Philippines	51	44	34[7]	−23
Thailand	48	44	33	−25
Turkey	45	41	34	−17
Egypt	42	41	41[9]	*
Iran	38	45	45	*
South Korea	38	33	23	−30
Burma	35	40	40	*
Total	2,558			
Mean		40	31	−23

[1]Excludes Vietnam with an estimated population of 52 million; information on vital rates over time is not thought to be reliable.
[2]The crude birth rates are for 1975 unless a later year is specified such as 33[7], 20[8], 41[9], with the superscript referring to 1977, 1978, and 1979, respectively.
*No significant change.

Bangladesh, Burma, India, Pakistan, Nigeria, or Egypt; but there is evidence of change in each of the other ten countries. The decline has been particularly marked (more than 25 percent) in China, South Korea, and Thailand, and has also been impressive (more than 20 percent) in Brazil, Indonesia, and the Philippines. The data on which these estimates are based are quite recent for several countries including Brazil, Mexico, and the Philippines.

The rate of population growth in developing countries is down from its recent peak, but not by much. It is now about 2.2 percent per year with a country range from about 1 percent to well over 3 percent.

Fertility declined more rapidly than mortality after 1965 in Asia and Latin America, and the rate of natural increase was smaller in Latin America and much smaller in Asia during the last five years than during 1960–1965. Fertility and mortality declines were about equal in North Africa and the Middle East; but in sub-Saharan Africa fertility did not decline, whereas mortality probably did, and thus the rate of natural increase there continued to climb to an estimated 2.9 percent per year.

The net effect of these differing trends in the developing countries was a modest decrease of about 6 percent in the rate of natural increase from 2.35 percent in 1960–1965 to 2.21 percent in 1975–1980, according to the United Nations (see Figure 1). Fertility decreases were significantly larger, a decrease from 40.0 to 33.6, about

16 percent. Mortality rates also declined from a crude death rate of about 16.8 in 1960–1965 to about 12 in 1975–1980. In developed countries, on the other hand, fertility has continued to decrease, but crude death rates have more or less stabilized for the present, as population aging has offset continuing improvement in age-specific rates. Rates of natural increase have thus fallen with fertility decline and are now only about two-thirds of 1 percent per year (see Table 3). Regardless of any realistically favorable developments of the next years, demographic momentum in the developing sector remains particularly strong.

Decomposition of Changes in Crude Birth Rates. Crude birth rates are affected by changes in the age composition, in marital patterns (including common law, religious, and civil unions), and in marital fertility. Any of these may be a significant contributor to a change in the crude birth rate. However, a shift from a high-fertility to a low-fertility pattern generally requires a major change in the total fertility rate and, in practice, a major change in the total fertility rate of married women. Changes in marriage pattern could, at the extreme, decrease the crude birth rate to zero and, in practice, have decreased crude birth rates by 10 points within a decade. Similarly, changes in marital fertility have accounted for a decrease of more than 12 points off the crude birth rate within a decade. Age-composition changes have also affected crude birth rates by as much as 5 points.

TABLE 3. *Rate of natural increase and percentage change in rate of natural increase, selected periods, 1950–1980*

	Rate of natural increase			Percentage change, 1960/65–1975/80
	1950–55	*1960–65*	*1975–80*	
World	1.77%	1.99%	1.81%	−9.0%
More-developed countries	1.28	1.19	0.67	−43.7
Less-developed countries	2.00	2.35	2.21	−6.0
Africa	2.16	2.49	2.91	+16.9
Latin America	2.72	2.77	2.66	−4.0
Asia	1.88	2.06	1.37	−33.5

Unfortunately, adequate data are not available for many countries to calculate the effects of changes in these three factors on changes in the crude birth rate. However, data are available for twelve countries, and these are given in Table 4. There is considerable variation in the effect of each of these factors in the different countries; but in general, age changes have worked negatively, retarding the declines in the crude birth rate by a few points. Changes in marital patterns (primarily later age at marriage) have accounted for roughly one-third of the observed changes, with decreases in marital fertility playing the largest role.

Causes of Fertility Decline. The causes of recent fertility declines, both in developing and developed countries, remain in some dispute, and probably will for many years. In broad terms, the dispute relates to the relative importance of changes in social and economic factors as compared with the role of family planning programs.

TABLE 4. *Components of crude birth rate declines,[1] selected developing countries, selected years, 1957–1975*

Country and years	Crude birth rate				Absolute change due to			Percentage of decline due to		
	Beginning of period	End of period	Amount change	Percentage change	Age structure	Marriage pattern	Marital fertility	Age structure	Marriage pattern	Marital fertility
Colombia, 1964–73	46.2	34.2	−12.0	−26	1.6	−2.0	−11.7	−13	17	96
Fiji, 1965/66– 1974/75	35.7	28.0	−7.7	−22	1.6	−2.2	−7.1	−21	29	93
Hong Kong, 1961–71	35.5	19.7	−15.8	−45	−4.2	−3.8	−7.9	26	24	50
Malaysia (West), 1960–69	42.9	34.6	−8.3	−19	−0.4	−5.6	−2.3	5	67	28
Mauritius, 1962–72	38.0	24.4	−13.6	−36	3.4	−7.2	−9.9	−25	53	73
Philippines, 1960–70	46.0	39.2	−6.8	−15	−1.2	−1.9	−3.6	18	28	53
1970–75	39.2	34.8	−4.4	−11	0.4	0.1	−4.9	−9	−2	111
Singapore, 1957–70	42.7	22.1	−20.6	−48	2.6	−10.9	−12.3	−13	53	60
South Korea 1966–74	35.1	25.4	−9.7	−28	0.0	−0.9	−8.8	0	9	91
Sri Lanka, 1963–71	34.4	29.9	−4.5	−13	1.9	−4.0	−2.4	−42	89	53
Taiwan, 1965–75	32.1	23.0	−9.1	−28	3.8	−4.5	−8.4	−42	49	92
Thailand, 1964/65– 1974/75	42.2	37.0	−5.2	−12	1.2	−1.0	−5.4	−23	19	104
Turkey, 1960–75	45	32	−13	−29	−1	−3	−9	8	23	69

[1]The crude birth rates shown in this table differ slightly in some instances from those shown in Table 2. They have not been adjusted because to do so would require an arbitrary adjustment of one or more of the components. Data are drawn from various sources and minor adjustments made for comparability across countries. Because of rounding, figures in any row may not reconcile exactly.
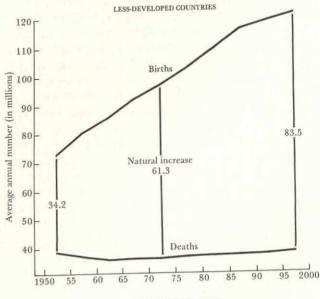
There is consensus that low fertility is always found in societies that have become industrialized and modernized, but there is increasing evidence that a high degree of modernization is not a necessary condition for achieving low fertility. China is the major example of a country that has achieved low fertility, without a significant degree of modernization. There are many historical examples as well. Family planning advocates argue that the provision of full information and the means for fertility control, under conditions of high-quality service, would help to speed fertility decline in many societies. In practice, almost all large countries, except Brazil, Burma and Nigeria, have adopted policies and programs designed to reduce fertility rates. They, of course, also seek to improve their social and economic situation. Some degree of consensus seems to be emerging to the following effect.
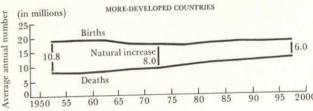
1. Marital patterns (later age at marriage, smaller proportion of reproductive age span spent within marriage) account for a substantial part of the recent decline, perhaps one-third in developing countries, but marital fertility itself is the major component even against a slight drag from age structure.

2. Social setting or development has a substantial relationship to fertility decline, certainly on a holistic basis, and probably especially so as regards health and educational status.

3. Family planning programs have a significant, independent effect, certainly in developing countries with favorable social settings and under certain conditions in less favorable settings as well (including the three largest countries—China, India, and Indonesia). Moreover, the older the program and the clearer its demographic intent, the greater its effect.

4. In combination, social setting and family planning programs predict or "explain" a large part of fertility decline.

Prospects. Populations with high fertility have a tremendous built-in momentum for growth, and high fertility is characteristic of most of the developing countries. There is not, however, an adequate theoretical structure for predicting within meaningful bounds the future course of fertility, and particularly not for indicating when fertility will begin to decline, and at what rates, in those countries where fertility rates are high and apparently unchanging. Nor can there be certainty about the pace of decline during the decades ahead in countries where declines have started, but fertility rates are still moderately high. The range of likely change for mortality is narrower than for fertility, but again the basis for making predictions about the future is mostly by analogy. Nevertheless despite the uncertainty about the future course of population growth, there is consensus on several major points.

1. Growth rates in developed countries are low; on average, the fertility of these countries is only at replacement level. A number of countries that are at or below replacement level now seek to increase fertility rates to or slightly above replacement level through a combination of positive incentives and, in some instances, restrictions on availability of contraceptive methods and abortion. A few of these programs appear to have met with some initial successes, but fertility rates are still low, though above replacement level. Fertility could, of course, increase in the developed countries, but most analysts foresee a world in which the growth of the developed countries is quite modest. The present population of developed countries is just over 1.1 billion; twenty years from now it is likely to be less than 1.3 billion.

2. Growth rates in developing countries are high. These will be moderated somewhat during the next two decades, but the momentum of population growth is strong, and this momentum will lead to *larger and larger absolute increases* in the population of the developing countries during the remainder of this century, even though fertility rates continue to decline (see Figure 2).

3. This momentum of population growth is caused by an age structure with a relatively large proportion of

FIGURE 2. *Average annual number of births, deaths, and population increase, 1950–2000, United Nations medium assumptions*

young persons who will move into and increase the size of the reproductive age groups for at least twenty years. The amount of momentum is affected by the current age structure and by present and future mortality and fertility rates. A typical country with past high fertility, and a current crude birth rate of about 40, would increase its population by 60 percent *even if* replacement-level fertility were achieved immediately. If it were achieved by the period 2000–2005 population would increase by 2.5 times before achieving stability.

For the world as a whole, most population projections for the year 2000 center on 6 billion. Thus, it is projected that global population will increase by about 1.5 billion during the next twenty years. Few analysts project figures that vary from these numbers by more than ± 200 million.

The medium assumption of the United Nations projects a population increase of 40 percent by the year 2000. Africa is expected to have the most rapid growth, more than 75 percent, and Latin America next most rapid with about 65 percent growth. South Asia would grow by 55 percent and East Asia by 24 percent according to these projections. Northern America and the Soviet Union would grow by 17 to 18 percent. Europe would grow very slowly, by only 7 percent.

There is a lack of consensus as to when fertility will begin to decline, and at what rate, in sub-Saharan Africa, Bangladesh, and Pakistan. There is no adequate theoretical basis for assessing when fertility will begin to decline in countries with high fertility, nor is there sufficient empirical experience in similar countries to make reasoning by analogy reliable. This lack of consensus is an important contributor to differences in projections that venture eighty to one hundred years into the future.

Nor is there consensus as to what the size of the world's population will be when it ceases to grow. A few optimistic analysts set the figure at around 8.5 billion, but a population of 10 to 12 billion seems more realistic. For example, if replacement-level fertility were reached in every country of the world by the year 2000, the population would grow to 8.5 billion. But such a rapid decline in fertility seems very unlikely. If replacement-level fertility were achieved by the period 2020–2025, the population of the world would grow to 10.7 billion. If the achievement of replacement-level fertility were further delayed, say to the period 2040–2045, the population of the world would grow to 13.5 billion. A consensus seems to be emerging that if the leaders of the major developing countries view rapid population growth as an impediment to economic development and act accordingly, and if the donor community also continues and perhaps increases assistance to such countries, the population of the

world might plateau around 10 billion. But larger numbers are all too possible.

W. Parker Mauldin

Directly related articles are FERTILITY AND DEVELOPMENT; POPULATION AND DEVELOPMENT. *See also* FERTILITY DETERMINANTS. *For further discussion of policies regarding fertility regulation, see* FAMILY PLANNING PROGRAMS, *article on* DEVELOPING COUNTRIES; LAW AND FERTILITY REGULATION, *article on* WORLDWIDE PERSPECTIVES. *See also* PROJECTIONS *and* WORLD POPULATION.

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FERTILITY CONTROL

See BIRTH CONTROL MOVEMENT; CONTRACEPTION; FAMILY PLANNING PROGRAMS.

FERTILITY DECLINE

1. THEORIES   Ronald Freedman
2. THRESHOLD HYPOTHESIS   K. Sivaswamy Srikantan
3. EUROPEAN TRANSITION   John Knodel
                           Etienne van de Walle

1.
THEORIES

Explanations of fertility decline in both developed and developing countries have undergone fundamental changes in recent decades. About forty years ago, sociology and demography were much simpler than they are today. Since relatively few facts were available then, it was possible to state and defend simple, coherent theories to explain population phenomena. Since then, many old theories have been cast into doubt by new data. What follows is a consideration of how new data and ideas have changed thinking about a central problem in the field: the circumstances under which the fertility of a popula-

tion falls from high to low levels. New observations, both about the history of the West and about recent trends in less-developed countries, have shaken the neat theories which once were held.

Two major questions are relevant for understanding fertility decline. (1) What leads to the motivation to have fewer rather than more children? (2) Once the motivation exists, are the concept and the means of fertility control automatically available and inevitably used or do they have independent causal roles in fertility decline?

Classical Demographic Transition Theory. In the past most demographers had few doubts about what motivates a desire for fewer children. The answer lay in the classical demographic transition model. Briefly, changes in macrodevelopmental variables—urbanization, industrialization, literacy, and the like—resulted in a shift from major dependence on relatively self-contained local institutions to dependence upon larger social, economic, and political units. Such a shift implies a change in the division of labor from one in which the family and local community are central to a larger complex in which the family gives up many functions to larger, specialized institutions. In both areas, new, nonfamilial institutions were of growing importance. Greater literacy and the development of effective communication and transportation networks were essential to all these changes.

As units of interdependence expanded and took over familial functions, the benefits and satisfactions derived from numerous children lessened. The costs of children increased, partly because they interfered with new, nonfamilial activities and partly because the improving standards of living, the increased education, and the opportunities in the new expanded system of interaction led to rising aspirations. Parents wanted more for themselves and their children. Many satisfactions, such as those derived from the achievements of their children, were more likely to be derived from investing in fewer children than in more children under the new conditions.

In this classical model, emphasis was on the changes in the objective structural developmental levels as primary in fertility decline. The new aspirations, the changes in the functions of the family, and new perceptions of the costs and benefits of children were seen as the necessary and almost incidental consequences of the developmental changes that lead to the demand for fewer children.

What is wrong with this formulation? There are, initially, problems in its application to Europe. First, the patterns of developmental conditions actually associated with fertility decline have turned out to be quite varied. Detailed empirical work has been unable to establish combinations of developmental variables at specific levels that were systematically related to the European fer-

tility declines. Countries that differed widely in industrialization and urbanization began their declines about the same time. Also, examples have been found in which less-advanced areas began their declines before more-advanced areas (Coale, 1973; Teitelbaum, 1975).

Secondly, detailed study of the European fertility transition has shown that many areas that were culturally similar, for example in language or ethnicity, also demonstrated similar fertility patterns, without prime reference to socioeconomic development indexes critical to transition theory. Subregions within a common culture tended to have similar patterns of fertility decline even though they had different developmental levels. It is possible that cultural differences in familial institutions involving such matters as inheritance customs and the status of women could be differentiating factors. Ansley J. Coale, Barbara A. Anderson, and Erna Härm have demonstrated that as late as 1970 a number of Asian Soviet republics with modern macrostructural characteristics had high natural marital fertility (Coale et al., 1979). The explanations offered are on normative and cultural grounds. In general, the evidence appears to indicate that cultural groupings often are related to fertility in ways that have not yet been explained by the general sociostructural factors central to transition theory.

A third problem with the classical position is that in its empirical tests the macrostructural variables were related directly to fertility. The looseness of this relationship may result from the failure to deal empirically with the changes in the family and in changing aspirations for self and children that are direct links between the macrovariables and fertility in the original formulation.

While this evidence tends to undermine the classical model, it is possible to argue that all of these exceptions in the West are short-run and unimportant. All general empirical observations about complex human behavior have exceptions. After all, the whole range of variables changed everywhere in the West across cultural and national lines. The modern Western nuclear family, low fertility, and high aspirations and standards of living are now an integral part of a specialized, highly developed, international social and economic system.

Transition in Less-developed Countries. Are all of the above factors necessary to motivate fertility decline? Hypotheses that merit consideration are (1) that subsets of objective development alterations, much smaller than those that characterized the West, can provide motivations for lower fertility today and (2) that under modern conditions, ideas and aspirations for a different way of life transcending what is actually available are also important in motivating lower fertility.

The fact is that fertility decline already has occurred in

a number of countries with only a limited subset of the development changes. For example, fertility has declined in such places as Sri Lanka, Kerala, Thailand, China, and probably in Indonesia—each with only limited developmental changes and with populations that are overwhelmingly poor and rural.

Just how much change in which subset of conditions is sufficient to motivate fertility declines is not known. Probably more than one combination will turn out to be sufficient. But, consider as examples Sri Lanka, Kerala, and China. They have at least a number of substantive changes in common: (1) better health and longer life, a situation that means fewer births are needed for the survival of any desired number and that encourages investment in the future; (2) higher education for both boys and girls, which increases the costs and decreases the benefits while children are in school; fewer, better-educated children may provide greater satisfaction than more, poorly educated children; (3) welfare institutions, providing minimum subsistence for the masses, at least in food, which may decrease dependence on children; (4) communication and transportation facilities capable of providing the information, services, and goods that have produced the other changes.

So, there have been concrete, if limited, changes that may have directly affected the real or perceived costs and benefits of children.

But there is something more than these objective changes. Increasing numbers of people have become aware of alternatives to their traditional life styles and aspire to something different, even though these aspirations often are poorly defined. However, this change in the realm of ideas and aspirations has a pace and character quite different from earlier changes in the West. One reason is that less-developed countries (LDC's) today potentially have transportation and communication facilities far more powerful and pervasive than those that were available in the West. These link such areas as those we are discussing to national and international networks. Furthermore, there is a great difference between the LDC's and the preindustrial West in what is carried by the networks. The LDC's potentially have available as part of their social environment the history, the development, the technology, and the rising standards of living in the West. The influence may be either directly from the network or, more probably, indirectly through local elites. The more literate the LDC and the better the communication system, the greater the potential effect of contact with the cumulative world inventories of models, ideas, and products.

The modern communication system can carry new models of the family and child-parent relations. The Chinese, for example, are loading their communication net-

work with new familial models and have made various changes designed to shift functions and power away from the family. However, it is not necessarily messages explicitly concerned with the family that have the most effect in changing perceptions about the costs and benefits of children. The new ideas and models, covering many aspects of life, may affect the demand for children by changing aspirations for other things wanted both for the children and for the parents. This possibility gains validation through the dissemination into the rural areas of many LDC's of such small items as the bicycle, the motor scooter, the sewing machine, the small pumping motor, the radio, and even the television set. These products change the lives both of those who have them and the larger number who want them.

The linkage to the national and world networks affects the identity of the individual and incorporates models, ideas, groups, and movements that transcend family and local community. These identities may be influenced by whatever image of the new person a government fosters through the communication network. But they are likely to be even more influenced by rock and movie stars, a charismatic political leader, a government bureaucrat, a hero athlete, and a host of other half-real and half-media characters with whom parents and children may identify. Young people who incorporate elements of such images in their self-concepts may be less willing to play some traditional familial roles.

It is not likely that abstract ideas alone have much effect on fertility. Obviously, there must be at least the changes in communication to provide the means for receiving these ideas. Beyond that, it is doubtful that exposure to the ideas alone could have much meaning without some actual validation in change.

Realistically, the material benefits that can be brought to the LDC masses in the next few decades are limited. But, important added components are rising aspirations and the perception of the possibility of a different life that is considered better by the people and goes beyond what reality offers objectively to everyone at the moment. Even within a closed society, that perception and aspiration may come from a revolutionary state that effectively links the masses to central institutions and transcends local and familial interactions, as appears to be the situation in China. The new perception and aspirations also may come not from revolution but from interdependence with the worldwide communication and trade system. Some combination of minimal changes in life conditions and linkage to the ideas of a larger system seem plausible as a sufficient combination for motivating lower fertility.

Recently, there has been much emphasis on the village as the place where developmental and population change must be rooted and motivated. This emphasis is

often related to the idea that equity in the distribution of goods and services makes for low fertility. It is difficult to know whether it is equity or the improvement in the standard of living of the masses that is the relevant variable. Either way, however, such changes at the lowest levels are improbable unless local communities are effectively linked to larger systems of resources and interchange. Without that, rhetoric and grandiose plans in a capital city are irrelevant.

This last observation is especially pertinent to the many negative instances—LDC's with little change in fertility, such as Pakistan or Bangladesh or Zaire. In these countries a common important factor is that the governments have been unable to set up administrative, communication, and transportation systems capable of reaching the village masses, either with the ideas of the outside world or with the minimal services and goods that make the new ideas and aspirations credible.

The causes of fertility decline are complex. The explanation probably does not lie only in a small subset of sociostructural changes and in new ideas generated by communication systems. It is very likely that there are facilitating and inhibiting factors that depend on the cultural context. For example, in societies in which women have low status and little education and are highly segregated, they are less likely to receive either the limited objective benefits or the new ideas that have been discussed. Women obviously have a special interest in the subject of reproduction. This may help to explain why fertility remains uniformly high in countries in which women are segregated and uneducated. They have neither the access to new ideas nor the stimulus to develop their own. This may be one reason that Muslim countries tend to lag in fertility decline, even when they have family planning programs. On the other hand, in Thailand, development is only at moderate levels and contraceptive use is rising rapidly. There, the position of women is unusually good. They are active in the labor force, involved in social and economic affairs, and not disadvantaged by any parental preference for sons.

John C. Caldwell, in a bold attack (1976) on the whole demographic transition concept, goes much further than I on the role of the dissemination of ideas. He argues that the nuclear family as a distinctive emotional unit is beginning to sweep the world—not necessarily as a part of economic modernization, but through Westernization—that is, through Western domination of schools and the international network of mass media. He reaches a provocative conclusion: "Fertility decline in the Third World is not dependent on the spread of industrialization or even on the rate of economic development. It will of course be affected by such development in that modernization produces more money for schools, for newspapers,

and so on; indeed, the whole question of family nucleation cannot arise in the non-monetized economy. But fertility decline is more likely to precede industrialization and to help bring it about than to follow it." (Caldwell, 1976, p. 358).

I agree with Caldwell that the dissemination of ideas may play a major role in motivating a desire for smaller families and that the Western nuclear family is certainly one possible model. However, the Western nuclear family is not necessarily a mandatory prior condition.

When it is asserted that people in LDC's are influenced by the ideas of the West, it is not meant that they adopt them whole. For example, while some changes in family life are almost inevitable with lower fertility, adoption of the Western nuclear model and abandonment of traditional familial values are not always a prior condition for large-scale adoption of contraception and a fertility decline. Consider Taiwan (Sun et al., 1978). In the early 1960s it was expected that, if the wide-ranging development then underway continued, it would make for fundamental changes in the Taiwanese extended family structure, resulting in preferences for fewer children, which then would lead to the adoption of contraception. Development and modernization did continue at a spectacular pace. But the massive adoption of contraception and the rapid fall in fertility occurred while the family retained many traditional forms and attitudes. For example, in 1973 more than 80 per cent of Taiwanese older parents lived with a married son if they had one. Married sons who do not live with their parents send them money. A large majority of young Taiwanese couples say they expect to live with a married son and to receive financial support from him in their old age. Eighty-eight percent say that having a male heir is important. There is a continuing, very strong preference for sons. There are almost universal aspirations for high education for children and for a high standard of living for both children and parents. There is also a perception of the rising costs of education and higher standards of consumption. But, all of this appears to operate along with traditional family values, which are changing slowly but are still very different from Western ones.

The Taiwanese apparently want to maintain intergenerational extended kinship ties in households equipped with television and all the latest electronic gadgets. They have rationally decided that this aim is feasible with fewer children in whom greater investment is made. The costs are similar to those in the West, but the perceived benefits are quite different. Large-scale adoption of birth control and smaller families need not necessarily be preceded by the development of Western nuclear families. It is, of course, possible that there will be a *later* convergence to a Western model.

Careful studies (e.g., White, 1975) appear to show that children may be net assets to their parents from a fairly early age in some LDC villages. Other studies (e.g., Mueller, 1976) come to different conclusions. But, the general validity of the studies depends on whether children and parents are willing to play the traditional roles that make children net assets. The child who acquires a strong taste for blue jeans or even a motor scooter may be less willing to play out the traditional role. In many LDC's, as a result of the communication network, there is a confusing mixture of values, material goods, and roles. Uncertainty as to how to behave is likely to grow, and uncertainty breeds thinking about alternatives from which social change flows.

It would be naive to think that in Taiwan or anywhere else a changing demand for children, involving new perceptions of their economic and noneconomic benefits and costs, emerged suddenly in a simultaneous flash of mass insight. More likely it was an emergent phenomenon. As social conditions and aspirations changed, dissatisfactions about such specific problems as housing, school costs, new employment conditions, and the status to be derived from children were only dimly and occasionally seen initially as connected to family size. Such problems provided a latent motive for fewer children, which became active over time. Within any population there must be a range of motivations for fewer children from latent to active, ambivalent to unequivocal.

Diffusion of the Idea of Family Limitation. The preceding discussion has assumed that social change of some kind is necessary to motivate a desire for fewer children. It is also possible that in some societies significant numbers of couples might have preferred fewer children than they were having but the concept that it was legitimate to control family size in marriage was not widespread. We do know that infanticide and abortion have been used extensively in premodern societies, but it is not clear whether they were used to limit the total number of children or as a reaction to emergency conditions.

Assuming that there is a latent or active motivation to control family size, what about the second major question—the availability of the concept and the means to achieve it? The classical view, to which I once subscribed, is that the concept and the means of birth control have always been potentially available for rapid adoption in all societies, but were not adopted or used much because there was no demand. When social change meant that fewer children were wanted in western Europe, large numbers of couples apparently adopted coitus interruptus, the condom, and primitive abortion. These means were sufficient to produce low fertility. We saw their adoption as incidental and almost inevitable. The fact that such primitive means produced low fertility is often cited as an indication that the idea and means of birth

control were not and are not an independent element in the situation.

There is now an argument for the thesis that, once motivation is present, both the concept of and the means for family limitation can have independent causal roles in determining both the timing of the onset and the rapidity of the fertility decline. It is important to differentiate the concept from the means of fertility control. That controlling family size in marriage is legitimate is a concept that may be absent or present to varying degrees in a society. Beyond that, there is the question of whether the cost, availability, legitimacy, and other characteristics of methods available and the system for delivering them affect either the acceptance of the concept or the prevalence and effectiveness of practice.

John Knodel has written about the possible independent effect of the concept of family limitation. The essence of his argument is that, before the modern fertility decline, the concept of family limitation in marriage, although sometimes present in small segments of the population, was not a part of mass thinking (Knodel, 1977). That the concept was legitimate and possible was an innovation adopted by significant numbers sooner in some places than in others. While the technology and methods of contraception were and are important, the idea that it is legitimate to use them in marriage can be treated as an additional integral part of an innovative cultural complex. Why the idea should catch on earlier in some places than in others is an important research question for which no answers are available, but the same uncertainty surrounds the introduction of many technological innovations.

The notion of an independent role for the adoption of the idea of family limitation is consistent with the fact that, once fertility fell in any European country or province by as much as 10 percent or so, it then almost always fell rapidly and continually to low levels. Since the developmental changes that presumably produced the motivation for fewer children occurred much more slowly, one would have expected a more-gradual adoption of birth control and a less-rapid decline in fertility if contraception were simply an incidental adjustment to growing motivation.

Although Knodel stresses innovation as a neglected element, he indicates that it is not a question of either adjustment or innovation, but of both: "The innovative behavior of family limitation permits fertility to adjust to the prevailing socioeconomic situation. At the same time, socioeconomic change occurred during the period of fertility transition and it seems reasonable to assume that as family limitation diffused fertility continued to adjust to current socioeconomic conditions" (Knodel, 1977, p. 248).

Knodel buttresses his argument by providing evidence

that, for a number of countries, the predecline age-specific fertility patterns had a shape that is characteristic of natural fertility. This means that any customs (e.g., breastfeeding) that affect fertility levels are not dependent on how many children a couple has; that is, they are not practiced to achieve a desired family size or to limit the number of children. If Knodel's evidence is valid, then the beginning of the fertility decline was a transition from essentially no family limitation to a rapidly increasing prevalence of family limitation, with the fertility decline outpacing the rate of development. If the dissemination of the idea of family limitation as legitimate has an independent causal role, this would help to explain the loose fit between macrodevelopmental variables and the fertility decline in western Europe.

That the idea of family limitation had some independent causality also may be relevant to the unexpected clustering in European cultural regions of the onset of European fertility declines. The common language and other shared aspects of the cultural regions could produce a culturally bounded communication network for the spread of such an idea.

The argument is that the motivation was necessary but not sufficient without legitimation of the idea. This also suggests that fertility might have fallen sooner in parts of western Europe if the idea of family limitation had already been widely available. The idea was not widely and openly discussed but was a hush-hush matter, adopted despite the opposition of the state, the church, the medical profession, and the information media. Also, the means of contraception were very primitive and not those increasingly chosen today. If modern contraceptives had been available when the concept of family limitation spread, that might have hastened both the adoption of the concept and the practice of it.

A second piece of evidence for the possibly independent roles of the concept and means of family limitation is that the rapidity with which contraception has spread and fertility declined in all major population strata in a number of LDC's far exceeds that of the European experience. For example, the rate at which such change has occurred in Taiwan was not anticipated in the early 1960s. This rapid change has affected all strata of the population—rich and poor, urban and rural, illiterates and college graduates. Between 1965 and 1976, in just eleven years, among illiterate Taiwanese wives of childbearing age, the proportion ever using contraception increased from 19 to 78 percent. Overall, fertility fell by 50 percent between 1961 and 1975. Changes of similar magnitude occurred in Korea, Mauritius, and Singapore. In Thailand, far less-developed than Taiwan in many respects, the proportion of rural wives ever using contraception increased from 11 to 35 percent in just six years. In one province of Thailand, Chiang Mai, the total fertil-

ity rate declined by 49 percent in fifteen years to just 2.67 children. Among the thirty-six LDC's with populations of 10 million or more—with 90 percent of the Third World population—fifteen had estimated birth rate declines of 10 percent or more between 1965 and 1975 (Berelson, 1978). These data indicate that the idea and practice of family limitation can sweep an LDC population far more quickly than was previously imagined possible.

How much fertility decline depends on the concept of fertility control and how much it is affected by the nature of the methods and the delivery system that provides them is an important area for research. It is plausible that methods that are effective, safe, and have other attractive features help both to legitimize the concept and to hasten the dissemination of practice. There is some evidence for this in the recent rapid spread of modern contraception among the disadvantaged members of the U.S. population.

It cannot be argued that the idea and practice of family planning can spread anywhere irrespective of changes in living conditions. For example, with one possible exception, there are no examples of substantial falls in LDC fertility in the post–World War II world without prior substantial falls in mortality.

Another kind of evidence that acceptance of the concept and availability of means of family limitation may have an independent role is the observation that the effectiveness of organized family planning programs is related to fertility declines above and beyond the effects of development levels. In a cross-national multivariate analysis of this issue, W. Parker Mauldin and Bernard Berelson (1978) found that development levels and family planning program effectiveness have both joint and independent effects on fertility. In addition to a major joint effect, an independent program effect is comparable to an independent development effect. However, where there is very little development, no program effect can be observed, presumably because an effective program cannot be mounted without minimal development levels. Good family planning programs are complexes that provide both the idea of fertility control and the means and services under medically optimal, culturally acceptable circumstances. Probably the better the services, the more likely the idea will be accepted and acted upon. However, unless there is at least a latent motivation for fewer children and the concept of family limitation is accepted as the normatively legitimate solution to the problem of too many children, providing the means and services cannot have much effect.

High-pressure Programs: China and Indonesia. Finally, two quite different situations, in China (Chen and Miller, 1975) and Indonesia (Hull, Hull, and Singarimbun, 1977; Sinquefield and Sungkono, 1979),

illustrate the possible independent effects of high-pressure, high-priority, family planning programs organized by the government to reach the masses in the villages. While the data for both countries are fragmentary and subject to criticism, the situations deserve special attention, both because of the size of the populations and the unusual conditions. The following summary is inferred from scattered and incomplete evidence.

China. It appears that China's birth rate has fallen from somewhere near 40 to less than 25—perhaps even less than 20—under the present regime. There is a general consensus among most observers that mortality levels have declined substantially, that educational levels have risen, and that the status of women has been improved by more education, more employment, and later marriage, making their position less dependent on their fertility. A floor on food and clothing is provided by rationing, and goods are more equitably distributed among large parts of the population. There is greater provision for security of older people, particularly in cities. In rural areas the communes appear to be taking over some functions of the family, but it is not clear how far this process has really gone. Yet, with all these changes, the country is still poor, and agriculture, while improved, yields no secure margin of safety for the still-burgeoning population. If the birth rate has fallen in China, it has occurred under conditions that remain far different from those of modern industrial societies.

The additional element important for our purpose is the massive Chinese national family planning program. It has been organized through the network of political and social organization that mobilizes the masses of the population in primary groups at their places of work and residence and relates them to the party and state hierarchy. That system is used to promote priority objectives, such as family planning, by persistent and repetitive messages, discussions, and both peer and authority pressure, which is so awesome in its extent that it is hard for a non-Chinese to comprehend. Sociologists have long respected the power of the primary group to mold behavior. The Chinese, in making the mobilization of the masses a centerpiece of their political and economic strategy, are demonstrating applied sociology of a very powerful type.

In China also, then, there is a subset of development conditions that very probably affect the costs and benefits of children, but with something added—a high-pressure, high-priority, family planning program working through a political and social system capable of reaching the masses of the population and influencing their interaction in local groups. This, again, is a configuration not easily predicted from the classical demographic transition model. We do not know whether China's apparent rapid fertility decline would have occurred when it did without its family planning program. The Chinese leadership, despite earlier ideology denigrating such Malthusian measures, apparently believes that adding the family planning program makes a substantial difference.

Indonesia. Also of unusual interest is Indonesia. In just a few years there has been a phenomenal increase in acceptors of family planning programs in a number of large provinces. Acceptance rates have increased from very low levels to almost 30 percent of eligible married women in Java and Bali together and more than 40 percent in Bali by January 1978. While there are doubts about the exact amount of fertility decline, preliminary estimates from recent surveys suggest declines in all provinces of Java and Bali and a probable decline of 35 percent or more in Bali.

Suppose the data confirm that a substantial decline has occurred in Indonesia with the extent of the decline linked to the rate of family planning acceptances. It will then be necessary to explain a fertility decline in a country and in provinces such as Bali that are overwhelmingly rural, poor, uneducated, and with health conditions far worse than those reported for Sri Lanka, Kerala, and China. The mass of the population is in villages where the pressure on available land is extreme. There are ambitious development programs for improving the lot of the masses, but no one claims much progress as yet. Strong political pressure and high priority are given to the family planning program at all levels of the hierarchy, and there is impressive progress in using village-level groups to bring to bear within them the power of local authority and peer pressure for acceptance, as well as to provide information and services.

From 1976 to 1979, the number of family planning service points in Indonesia increased from three thousand or so clinics to more than forty thousand village and hamlet distribution posts, bringing supplies, information, and motivation much closer to the potential user. The intent, apparently successful in some places, is to increase the involvement of local groups in managing the program.

If it turns out that the data are reasonably valid, Indonesia could be the instance of a large country in which a highly organized family planning program, communicating to the village level, made a crucial difference in expanding the concept and practice of family limitation in improbable circumstances.

Why should Indonesian peasants have enough motivation to respond to the program's information and pressure? One possibility is the combination here of Malthusian pressure and some limited aspects of development. As to Malthusian pressure, the agricultural involution described by Clifford Geertz (1963), involving sharing

the task in more and more intensive application of labor, may have gone as far as it can go in much of Java and Bali and may have made the cost-benefit ratio of children less favorable than in the past. There is evidence in some studies that the lower-status groups had adopted practices to keep their fertility below average even before the program. This may be evidence both of Malthusian pressure and the fact that the idea of family limitation may already be present. There is also the evidence of modern development as an influence in raising aspirations for new consumer goods, agricultural inputs, and education in many villages in Indonesia. Another modern influence is the government control and communication system capable, for example, of reaching the villages and getting quick feedback about the family planning program itself.

In terms of affecting the lives of millions of people in the villages, the family planning program is probably Indonesia's most successful developmental program, perhaps because, unlike agricultural reform, for example, extending family planning services does not immediately threaten local vested interests. There is some evidence that the local family planning mothers' groups are taking on other functions such as nutrition, health, and crafts. There is some thought of linking other development efforts to this base. It will be ironic if family planning, which is supposed to languish without development in other areas, turns out to be leading rather than following the development process.

It would be a serious mistake to say that the undoubtedly successful family planning in Bali, for example, is totally responsible for a decline in fertility. Bali is still poor and rural. But consumerism has considerably increased and aspirations have risen. Throughout the island such things as blue jeans, motorbikes, minibuses, soda pop, radios, and community-shared television are obviously present. By no means does everyone have them, but everyone seems to want them. They are present in a fascinating mix with traditional Balinese art, religion, ceremonies, and dress. At the same time, parents, themselves not well educated, want education for their children despite its costs. Malthusian pressure plus rising consumer and educational aspirations, but little progress by the conventional standards of development, is quite a mix. Perhaps scholars have paid attention to the wrong indicators of social change.

It may seem like standing theory on its head to indicate that extreme Malthusian pressure and rising consumer aspirations rather than conventional development progress may provide primary motivation for adopting family planning in some instances. But it is at least plausible that fertility control might be adopted by many if economic conditions endanger both survival and attainment of new goals, and if respected or feared authority figures strongly suggest a viable alternative.

Even if these mechanisms are at work in Indonesia, we do not know how long they will be sustained. Certainly Malthusian pressure is not to be recommended as a policy. One would hope that more-effective development policy or the success of the family planning programs may relieve the pressure. Under some circumstances, the easing of pressures might increase again the demand for children in some families. If the apparent progress in establishing and legitimizing the idea of family limitation is real, however, its influence may be lasting.

The concluding, rather unusual situation in Indonesia is an extreme illustration of one of the morals of the story: there are multiple pathways to fertility decline.

Summary. The principal points of my argument are seven, which may be summarized as follows.

1. Motivations for lower fertility are derived from perceptions by parents that there is an advantage to having fewer children than they are having, perceptions arising from some change in life conditions. In some instances, such motivations existed and led to lower fertility even before the modern industrial period.

2. The major modern transition from high to low fertility in the West had as an essential feature major shifts in functions from the family to larger nonfamilial institutions, part of a growing national and international network of productive interdependence. It is not known just which aspects of that great transformation changed life in ways that produced the motivations for fewer children.

3. It is now known that, under current conditions, high levels of modernization on the Western model are not a necessary condition of fertility decline. The motivations for low fertility may come from relatively small subsets of developmental changes, without the high standards of living, urbanization, and other hallmarks of the Western industrial complex.

4. In addition to the direct effect of actual changes in life conditions, changing perceptions of what is desirable and possible can affect motivations about family size. This change results from literacy and from communication and transportation links to the growing world storehouse of models, ideas, and things. Such change may lead to the adoption of existing models or to creating new amalgams of the old and the new, as in family patterns that combine contraception, small numbers of children, and extended familial ties. What is new as compared with the Western transition is (1) the much greater power and pervasiveness of the world network of communication and interdependence, and (2) the much greater stock of culture carried by that network.

5. Both the concept and the specific methods of family limitation appear to have additional causal force of their

own, which helps to determine when motivations for lower fertility are realized and at what rate.

6. Cultural factors—that is, factors not easily translated into the customary development variables—appear to affect both the demand for children and the readiness to accept birth control.

7. With respect to what is required to change both the demand for children and the adoption of the concept and means for family limitation, social systems that involve the masses of the population are essential to provide the actual minimum changes in life conditions, to change aspirations and perceptions of the future, and to distribute the means of fertility limitation in acceptable ways.

A note of cautious optimism is warranted both as to policy and research. If fertility decline is possible without massive industrial modernization on the Western model, then the potential for fertility decline relatively soon is greater for many LDC's than may be expected from the predictions of the doomsday prophets. That does not mean that fertility decline will be easy or inevitable. Even the limited development, the administrative-communication networks, and the family planning programs described briefly can only be attained with great effort and political will. And any policies in those areas will have to deal with the different cultural contexts that seem to affect the success of a policy, even if just what they are is not understood. There is exciting work to do in social research because the cut-and-dried transition theory on which most demographers were nurtured does not seem to be enough.

Ronald Freedman

See also DEMOGRAPHIC TRANSITION THEORY; FERTILITY DETERMINANTS; VALUE OF CHILDREN.

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2.

THRESHOLD HYPOTHESIS

The threshold hypothesis is an attempt to link the demographic transition with concurrent or preceding social change and economic development. According to this hypothesis, fertility is initially high, and improving economic and social conditions are likely to have little if any effect on it until a certain economic and social level is reached; but once that level is achieved, fertility is likely to enter a decided decline and to continue downward until it is again stabilized on a much lower plane (United Nations, 1965).

The concept of a critical threshold is not new to the social sciences. In psychology, there are hypotheses connecting stimulus thresholds with response, and in economics, self-sustained growth has been formulated on the notion of a "take-off" stage.

The threshold hypothesis may be stated in three simple propositions. (1) In temporal terms, a period of fluctuating "high" natality is replaced by one of declining natal-

ity at some point in the demographic history of the country. This again is replaced at a later stage by another period of fluctuating "low" natality. (2) Decline in natality is associated with decline in mortality and changes in values, norms, and socioeconomic institutions. (3) Decline in natality is triggered initially when one or more of the associated variables reach certain threshold values.

"High" and "low" fertility are relative to a region, country, and time period. Decline in natality should be a "true" decline, neither a random variation nor a spurious fall arising from imperfections in the definitions of the fertility rate used or in its statistical estimation. Further, the decline should persist over a period of at least ten years, possibly at an accelerating pace, so as to produce a substantial difference between the initial and final levels of fertility.

The threshold hypothesis concerns the fertility component in the theory of demographic transition. It shares with this theory the assumption that declines in fertility are interrelated with declines in mortality and with changes in social values and norms and socioeconomic institutions. The threshold hypothesis differs from the conventional theory of demographic transition, however, in several important respects. The hypothesis does not formulate a rigid causal chain between fertility and concomitant variables; this is left as problematic, to be investigated empirically. Nor does it assume that the final and permanent population balance should be secured by a single transition. Finally, the threshold pattern may vary from region to region, depending on cultural and social institutions.

The United Nations study on the threshold values of indicators touching off a fertility decline concluded:

The analysis has brought out some reasons for believing that the levels reached in indicators pertaining to means of communication, health and education may be more pertinent than the levels of other indicators in this respect. But for any of the indicators, there is obviously nothing immutable about the values that would correspond to such a threshold of decline in fertility; these values could be greatly changed under the influence of changing conditions in the world. Indeed, they have undoubtedly changed greatly in the past. In regard to expectation of life, for instance, fertility decline occurred in the past in countries where life expectancy was considerably less than it is at present in many of the less developed countries where fertility remains high. (United Nations, 1965, p. 150.)

In a more recent empirical investigation of the threshold hypothesis (Srikantan, 1977), the relationship of fertility levels to some indicators of social change and economic development among seventy-five countries was analyzed cross-sectionally. The pattern of correlations among these indicators showed the level of fertility to be an integral aspect of development. Lower fertility was associated closely with certain aspects of modernization and structural change.

Subsequently, threshold analysis was performed for each of the twenty-one indicators. Nineteen of them displayed substantively and statistically significant threshold ranges. There was definite and extreme separation in socioeconomic development between countries of high and low fertility. These patterns strongly suggest that, in the long run, relevant aspects of social change and economic development tend to occur together and along with fertility decline.

A few countries were found to be in fertility transition and they did not consistently conform to the threshold pattern between high and low fertility countries. For most countries not in fertility transition, however, evidence suggests a continuum with close gradations by levels of development. Joint fertility threshold indicators for such countries were found to be female life expectancy, per capita energy consumption, percent of economically active population in agriculture, percent of first-level school enrollment that is female, population per hospital bed, and daily newspaper circulation per population. A cluster analysis of countries was done on the basis of similarities for these six indicators. Without reference to the fertility level, the cluster analysis arrived at a grouping similar to the one based on fertility and confirmed the conclusions of the threshold analysis. It suggested further that the dissimilarities in socioeconomic indicators between countries increase during transition and decrease sharply thereafter.

The application of the threshold hypothesis at aggregate country level averages out intracountry heterogeneity in cultural and societal variables, as well as differential change in socioeconomic and demographic factors within the country. Stratification of society into classes on the basis of social status, economic functions, religion, ethnicity, and several other factors, however, is always present in both large and small countries. Differential changes among classes have been noticed in data on the European demographic transition; the higher socioeconomic classes are ahead of the lower classes at least in the incipient stages of modernization. These aspects cannot be incorporated into an analysis at country level. Moreover, interpretation of the results of cross-sectional studies to obtain longitudinal implication is subject to various assumptions. Despite these limitations, the results strongly support the existence of threshold effects, although their precise form may vary according to the country context.

<div align="right">K. Sivaswamy Srikantan</div>

See also DEMOGRAPHIC TRANSITION THEORY; FERTILITY DETERMINANTS, *article on* SOCIOLOGICAL AND ECONOMIC THEORIES.

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3.

EUROPEAN TRANSITION

The fundamental change from high to low fertility occurred throughout Europe during the late nineteenth and early twentieth centuries. A much more detailed picture of this historical shift is available in the 1980s than just a decade earlier. Two quite different types of demographic studies have been largely responsible for the recent expansion of our knowledge of historical trends, especially in fertility: (1) microlevel family reconstitution studies, which typically refer to village populations during the preindustrial period generally before the decline in fertility, and (2) macrolevel studies of the long-term decline in fertility on the national and provincial level. The first type of study is based on the reproductive histories of particular couples reconstituted usually from church registers of baptisms, burials, and marriages. Also included in this category are studies based on genealogies of special subgroups of the population, particularly social elites, for whom previously compiled genealogies are readily available. Such studies are available from most European countries, although they cover only a minuscule proportion of the total population. Usually family reconstitution studies span long periods of time, extending back well before the general long-term decline of fertility. They provide detailed information on reproductive behavior that can be used to test a variety of hypotheses within the framework of the family.

The second type of study is labeled macrolevel because it is based largely on published census and vital statistics data for such relatively large, administratively defined geopolitical units as districts, provinces, or states. A study of the European fertility decline based on these kinds of data has been undertaken by the Office of Population Research at Princeton University under the direction of Ansley J. Coale. Considerable information has been unearthed on both the demographic trends over the last century or so at the provincial level and the general socioeconomic context in which they occurred.

In addition to the contributions made by these two types of studies, both of which provide extensive quantitative evidence, our understanding of reproductive behavior in the past is also being increased by a third group of studies that are largely qualitative. Such studies stem more out of the tradition of social history than of demography. They are often based on literary evidence, including letters and novels, and on commentaries by contemporary observers such as nineteenth-century statisticians' interpretations of vital statistics and county and small-town medical doctors' reports on their patients and on local health-related conditions. These studies shed light on the extent of people's knowledge of birth control and their attitudes toward reproduction and children in the past and help place the newly emerging quantitative results in their social, psychological, and cultural context.

On the basis of these combined sources, we arrive at four main findings regarding the European transition from high to low fertility, or interpretations of the evidence. (1) Fertility declines took place under a wide variety of social, economic, and demographic conditions. (2) The practice of family limitation was largely absent (and probably unknown) among broad segments of the population prior to the decline in fertility, even though a substantial proportion of births may have been unwanted. (3) Increases in the practice of family limitation and the decline of marital fertility, once under way, were essentially irreversible processes. (4) Cultural settings influenced the onset and spread of fertility decline independently of socioeconomic conditions.

A variety of evidence supports each of these conclusions. It is important to recognize, however, that a definitive interpretation of the historical demographic transition is unlikely to be forthcoming soon. In this article, we present what we believe are the most plausible interpretations, but we acknowledge that other interpretations are possible. Our discussion is limited to the European (especially western European) experience because it has been the subject of more extensive research. Historical studies of fertility are also appearing for North America, Japan, and other areas, but they are less numerous.

One important difference between the western European demographic experience and that of developing countries today, as well as nonwestern European countries in the past, should be borne in mind: the difference in nuptiality patterns. Western European populations during at least the seventeenth through nineteenth centuries were characterized by marriages at relatively late ages and high proportions of people remaining permanently single in comparison with other populations in the past and certainly in comparison with most current populations in developing countries. The unique western European marriage pattern played a crucial part in the larger demographic picture of preindustrial Europe,

keeping overall birth rates typically below the levels experienced in most developing countries today. The focus of this article is mainly on marital fertility and thus does not address this difference.

Socioeconomic Context. The most striking finding to emerge from the recent upsurge of research on the fertility transition in Europe is that it occurred under remarkably diverse socioeconomic and demographic conditions. Table 1 lists a series of indexes of socioeconomic development at the time of the onset of the fertility decline for seventeen countries of Europe. Onset of fertility decline is defined as the year by which marital fertility had declined by an estimated 10 percent from its maximum recorded level in the course of a continuous decline to a much lower level.

Although the fertility decline began in England only after considerable urbanization and industrialization had taken place, it occurred at about the same time in Hungary, which was at a substantially lower level of development as measured by conventional socioeconomic indexes. Indeed, the first country to show signs of fertility decline was France, where birth rates started to fall around the time of the French Revolution. France could hardly be considered very advanced industrially at the time. In addition, recent research has revealed several examples of local populations outside France where the fertility transition began in rural settings long before there was evidence of socioeconomic development.

Differences in the level of literacy reached by western European countries at the time of their fertility declines were also considerable. Within each country, no consistent relationship has been found between education and fertility. European fertility itself varied greatly before it declined. Not only did very diverse combinations of birth and death rates make for a wide range of growth rates at the time of the transition, but also variations in the proportions of people married (typically low in western Europe and high in eastern Europe) influenced the levels of overall fertility before the decline.

The decline of infant and child mortality has often been singled out as a decisive influence on the perceptions of parents about the desirable size of the family. It has been argued that parents demand fewer births when the supply of living children (the combined result of fertility and mortality) increases. Yet fertility declined under a wide variety of infant mortality conditions, as is apparent not only from the cross-national comparison in Table 1 but also from provincial comparisons within countries. In Germany, marital fertility actually tended to decline earlier in areas with higher infant mortality than in areas with lower levels. In most instances, the decline of child mortality, but not necessarily infant mor-

TABLE 1. *Starting date of fertility transition and indicators of concurrent demographic and socioeconomic conditions: selected European countries*

Country[1]	Date of decline in marital fertility by 10%	Marital fertility before decline (I_g)	Proportion of women married (I_m)	Overall fertility (I_t)	Infant deaths per 1,000 live births	Percentage of male labor force in agriculture	Percentage rural[2]	Percentage in cities over 20,000 population	Percentage illiterate[3]
France	ca. 1800	.70	.51[a]	.30[a]	185[b]	70	81	7	High
Belgium	1882	.82	.44	.35	161	30	56	22	30
Switzerland	1885	.72	.44	.29	165	33	78	9	Low
Germany	1890	.76	.50	.39	221	38	68	21	Low
Hungary	ca. 1890	.63	.70	.45	250	73	84	11	49[c]
England and Wales	1892	.68	.48	.31	149	15	28	57	Low
Sweden	1892	.71	.42	.31	102	49	81	11	Low
Scotland	1894	.75	.42	.31	124	13	27	49	Low
Netherlands	1897	.85	.45	.35	153[b]	29	26	42	Low
Denmark	1900	.68	.47	.32	131	42	61	23	Low
Norway	1904	.75	.42	.30	76	37	72	18	Low
Austria	1908	.68	.51	.36	205	40	—	19	21
Finland	1910	.70	.46	.31	114	66	85	9	44
Italy	1911	.68	.54	.36	146	46	38	28	39
Bulgaria	1912	ca. .70	ca. .74	ca. .45	159	70	82	7	60
Spain	1918	.64	.51	.30	158	66	45	26	46
Ireland	1929	.71	.35	.23	69	48	73	20	Low

[1] Country borders are as of date of decline. All figures refer to the year estimated as the date of a 10% decline in marital fertility except the index of the level of marital fertility before decline. Estimates were obtained by interpolation or extrapolation when data were not directly available for the year indicated. [2] In communities of fewer than 5,000 or legal definition. [3] Both sexes, aged 10+ or 15+; "High" refers to percentages of young adults unable to sign their names on the marriage certificate or of illiterate army recruits, exceeding 50%; "Low" refers to percentages under 10%. [a] In 1831. [b] Children dead after registration only. [c] 6+.

SOURCE: Knodel and van de Walle, 1979, table 1, pp. 221–222; reprinted by permission.

tality, had started before marital fertility dropped. Before a causal link can be established, the extraordinary differences in the lags between the two declines will have to be explained. For instance, infant mortality in Ireland had reached comparatively low levels when marital fertility started to decline, while in Belgium and Germany infant mortality was still quite high. In addition, in some areas infant mortality, if not child mortality, dropped either at the same time as or later than fertility. At this stage, no definitive conclusion can be reached on the role of declining mortality in the shift to declining fertility in western Europe. Moreover, whereas most European countries experienced fertility decline before infant mortality had fallen significantly, in most countries of the world today infant mortality has fallen substantially. There is little evidence that this fall has been sufficient in itself to initiate a drop in the birth rate.

In general, an examination of the social, economic, and mortality conditions at the time of the onset of the fertility decline in various European countries reveals no consistency in the level of development. Of course, it would be unrealistic to expect absolute consistency in these measures, even if some threshold of socioeconomic development were the critical prerequisite for fertility decline. The measures are crude and suffer from varying degrees of noncomparability across countries. Also, varying combinations of development might be interchangeable with respect to initiating the fertility transition. It seems highly unlikely, however, that such considerations could explain away the remarkable extent of diversity evident in Table 1. In an extreme case, such as Bulgaria, fertility began to fall at a time when the population was almost entirely rural and agrarian and was largely illiterate. Clearly, large genuine differences in the level of development existed among European populations at the start of their fertility declines. It seems safe to conclude that there was no clear threshold of social and economic development required for the fertility transition to begin.

Fertility Behavior before the Decline. Direct evidence of the use of birth control is generally lacking for historical European populations. One of the important advances in modern historical demography has been the development of indirect techniques to determine whether couples were practicing some form of family limitation within marriage. "Family limitation" as used here refers to behavior intended to stop childbearing at some particular number of children and is thus a special case of the use of birth control, an expression that refers to both stopping and spacing the arrival of children. Deliberate attempts to space births may also have been absent in the period before the decline of fertility, but most of the indirect techniques developed so far are capable only of detecting the absence of behavior to stop births. These techniques involve measures that can easily be derived from family reconstitution data, such as age-specific marital fertility rates and the age of mother at last birth. They are based on the observation that couples generally terminate childbearing earlier and marital fertility declines more rapidly with age in populations in which family size is deliberately limited than in populations characterized by natural fertility, that is, fertility in the absence of family limitation.

Ansley J. Coale and T. James Trussell have developed an index of family limitation, called m, based solely on the age structure of marital fertility and independent of the level of fertility (Coale and Trussell, 1974, 1978). It is calculated by comparing the age pattern of the observed marital fertility schedule with a "standard" natural fertility schedule, based on a series of populations that are presumed to practice little or no contraception. The more the observed age pattern deviates from that of the standard schedule in a predicted fashion (i.e., proportionately more at older ages), the higher the value of m, and hence the greater the amount of fertility control implied.

Application of this technique to the results of the many family reconstitution studies, as well as to official statistics when available, indicates that family limitation in western Europe was either absent or quite minimal (perhaps limited only to special segments of society, such as the social elites) prior to the onset of the long-term decline in marital fertility. When the index m of fertility limitation can be computed prior to the decline of fertility, it is usually close to zero and unchanging. When m begins to increase, the change is typically marked, as is the change in the trend of fertility.

Family limitation emerges among some groups of the population much earlier than among others and long before any urban-industrial transformation is evident. This is especially true among certain groups of social elites, such as the Genevan bourgeoisie or the French and Italian nobility, although early signs of family limitation are found in some village populations as well, especially in France, where family limitation is commonly detected in the rural population by the end of the eighteenth century. The same populations that are characterized by early evidence of family limitation also experience early fertility decline, and when the data for these populations extend back to the period before the decline, signs of family limitation are lacking. In other words, the evidence does not suggest that family limitation was practiced at some moderate but constant level prior to the fall in marital fertility rates. Instead, it seems to have been quite minimal and often completely absent.

Evidence that family limitation was not practiced to any great extent prior to the fertility decline does not necessarily mean that it was unknown. It is possible that

couples had little motivation to use birth control techniques; because many children died, families may not have been as large as most parents wished. Indeed, the lack of motivation to reduce fertility is often given as the reason why fertility remained high for as long as it did. Although such an interpretation cannot be definitely ruled out, indirect evidence leads us to conclude that family limitation was not known to the majority of couples prior to the fertility transition period and thus was not a real option for them. Moreover, additional evidence suggests that births were frequently unwanted, especially by women, and thus at least latent motivation to reduce fertility existed.

First, in populations before the decline, couples apparently made little effort to adjust their reproductive behavior to their own experience with infant and child mortality. Couples whose children all survived continued to produce children almost as long as couples whose children had died early. Thus, couples who would seem to have had the greatest incentive to practice family limitation—those whose children all survived—did not do so to any great extent.

Second, a comparison of trends in marital and non-marital fertility indicates that both declined more or less simultaneously in most European countries. It seems unlikely that motivation to avoid out-of-wedlock births was absent before the period of fertility decline and that by mere coincidence such motivation emerged at the same time as married couples were deciding to have fewer children in response to new social, economic, and demographic conditions. The large number of foundlings apparently deserted by unwed mothers in the eighteenth and nineteenth centuries underscores how unwanted many illegitimate births were. A more plausible interpretation is that birth control practices were not widely diffused prior to the parallel declines in legitimate and illegitimate fertility and that the spread of the knowledge and skills to avoid unwanted births enabled both married and unmarried couples to reduce their fertility simultaneously.

Literature of the time on infant mortality and the rearing of children sheds light on underlying attitudes toward reproduction and family size during the period prior to the fertility transition. Abusive child care practices and general neglect appear to have been commonplace in much of Europe, suggesting that children were not necessarily welcome additions to the household. While outright infanticide was not unknown, especially among unwed mothers, far more common were traditional practices of infant hygiene and child care that led to what social historians today label "concealed infanticide" or "infanticide by neglect." Such practices included sending the baby out to a wet nurse; dosing the infant with gin or opiates to keep it quiet; having the baby sleep in the same bed with the parents, thus risking "overlaying" and consequently suffocating it; leaving the infant unattended lying in its own filth—often in stifling swaddling clothes—for hours on end; feeding the baby unwholesome "pap" from an early age instead of breast-feeding it; and rocking the infant violently in its cradle until it was virtually knocked into a sleep of insensibility. Not all these practices were common everywhere, of course, but collectively they surely contributed to the high infant and child mortality that characterized much of Europe in the eighteenth and nineteenth centuries.

Even more to the point, observers at the time reported that parents, particularly mothers, were frequently indifferent to the departure or loss of a child and in some instances welcomed the death of a child as an easing of their burden. Such reporters appear not to be describing isolated incidents but rather pervasive attitudes among a poverty-stricken populace. Such evidence is hard to reconcile with the contention that couples declined to use birth control because they wanted to maximize their family size. Rather it suggests that many women continued having unwelcome births because there was little option to do otherwise.

In some respects, it seems reasonable to argue that negligent practices of rearing children and the resulting infant and child deaths served as a way to limit family size in the absence of birth control, particularly in view of the apparent unwillingness of parents to change their ways despite the frequent decrying of these practices by authorities. From this perspective, the high infant and child mortality rates found in much of Europe prior to the fertility decline can be considered as much an accommodation to high fertility as the opposite. Such an interpretation helps explain why a prior decline in infant mortality was not a necessary precondition for marital fertility to start to decline in a number of areas of Europe.

Literary evidence and scattered commentaries by observers of the time are an unreliable basis for establishing facts about fertility in the past. But there is little else to go on. For whatever it is worth, this evidence is consistent with the idea that family limitation was not widely available or acceptable prior to a radical change in attitudes. Although such a change cannot be dated with precision, the statistical record is consistent with the suggestion that the adoption of contraception within marriage occurred suddenly, and massively, in large segments of the population where its use had been previously extremely limited because it was either unknown or objectionable.

Irreversibility of Family Limitation and Fertility Decline. Populations that do not use contraception exhibit a broad span of fertility levels, in part because of differences in proportions of married among the population in

the reproductive ages, but also because of the variability of marital fertility, even in the absence of deliberate family limitation. On a scale giving the value of 1.0 to the highest marital fertility ever reliably recorded, that of the Hutterites of North Dakota married in the 1920s, national populations are scattered at various levels between 0.6 and 0.9. This is the meaning of the index I_g, in Table 1. The index I_f has a comparable structure, but refers to all women, rather than only married women, and reflects the additional effect of I_m, the proportion married, on overall fertility. It is always lower than I_g because in all populations some women in the reproductive ages are unmarried, and these women virtually always experience lower fertility than married women. Figure 1 gives national values for the index I_g over time in various European countries. Two features emerge: first, where figures go back far enough in time, it is usual to find a plateau of high I_g's from which deviations are minor until an irrevocable and decisive plunge occurs; and second, this high level before the decline varies from country to country but is usually between 60 and 80 percent of the maximum performance of the Hutterites. Fluctuations before the decline are typically moderate, and the change in trends, from a more-or-less level plateau, is sudden and unambiguous, so that an approximate date can be assigned to it.

Examination of the time series of the index of family limitation, m, and the index of the level of marital fertility, I_g, for Sweden (Figure 2), a country where fertility began to decline in the late nineteenth century, reveals

that once the I_g index starts to fall below the level before the decline, the trend continues virtually uninterrupted until radically different levels are achieved.

The association of rising m values with the decline in marital fertility helps confirm that the fertility transition results from a new form of reproductive behavior rather than from an extension of previously established patterns. Recall that the m index is based solely on the age pattern of marital fertility is entirely independent of the fertility level. The rising m values associated with the fertility transition indicate that an earlier termination of childbearing and a disproportionate reduction in fertility at older ages contributed to the fall in fertility. In contrast, any deliberate control of marital fertility prior to the transition must have been through lengthening the period between births. We know this from the results of a large number of family reconstitution studies, which make clear that, historically, over long periods of time and across diverse populations, the average age of women at last birth was remarkably consistent prior to the fertility decline, generally close to 40. It seems reasonable to assume that this average was largely biologically determined. Thus, the substantial differences in levels of marital fertility before the decline are attributable to differences in the average birth interval, whether the result in part of deliberate spacing or otherwise, and are not the result of differences in the age at which couples stopped having children. Stopping childbearing was new for most couples, and according to the findings of a study of German village populations, its increasing practice appears
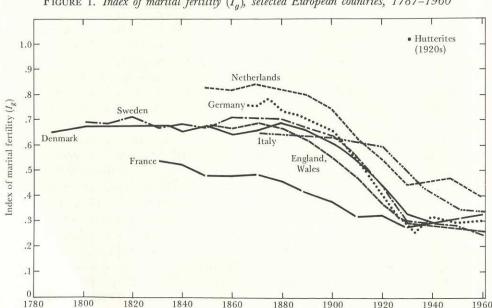
FIGURE 1. *Index of marital fertility (I_g), selected European countries, 1787–1960*

Sources of data. England and Wales, France, Italy, Netherlands, Sweden: Princeton European Fertility Project. Denmark: van de Walle, 1949. Germany: Knodel, 1974.
SOURCE: Knodel and van de Walle, 1979, fig. 3, p. 17; reprinted by permission.

FIGURE 2. *Index of marital fertility (I_g) and index of family limitation (m): Sweden, 1800–1960*

to account almost entirely for the initial phase of the fertility decline, since the average birth interval remained fairly constant as fertility started to drop. Only later in the transition do increases in the average birth interval make an important contribution to lower fertility levels. Thus, whether or not deliberate birth spacing was practiced prior to the decline, a new and different type of fertility control—stopping behavior, or what is called family limitation—appears to be responsible for precipitating the fall of fertility to modern levels.

Sweden is not an isolated case in the historical record. Examination of the changes in the age pattern of marital fertility in European populations over time, evident in both official statistics and family reconstitution studies, indicates that throughout Europe once the practice of family limitation rose above minimal levels, it continued to increase in a virtually uninterrupted fashion until it reached much higher levels. Likewise, examination of time series of the level of marital fertility indicates that once a decline began it continued steadily until much lower fertility, typically well below 50 percent of the level before the decline, was achieved. This irreversibility is apparent on the national, provincial, and even village levels, as well as for special subgroups such as the social elites covered in some family reconstitution studies. Moreover, the trends in increasing family limitation and declining marital fertility are largely coincident. This generalization holds for virtually all populations, including those that experienced unusually early signs of family limitation and fertility decline, although in such cases the pace of change was generally slower. In brief, the increase in the practice of family limitation and the decline of marital fertility seem to be one-way processes that generate a momentum of their own.
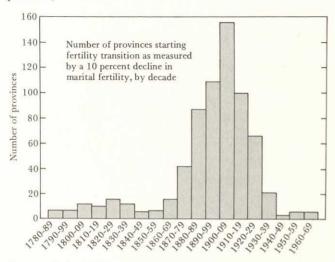
Influence of Cultural Setting. Despite the great diversity of their socioeconomic characteristics, the striking

factor that the countries of Europe had in common when fertility declined was time itself. With the exception of the forerunner, France, and a few stragglers, such as Ireland and Albania, the dates of decline were remarkably concentrated. There were fluctuations of small amplitudes during what is called the plateau of high fertility before the decline; but past a certain "point of no return," which is placed at 10 percent of the peak immediately preceding the decline, the decline had clearly begun. These dates are given in Table 1 for selected countries where the records extend far enough and with enough regularity to cover the story from its beginnings. The close agreement of dates is the dominant feature of the table: fourteen of seventeen countries began their decline within a thirty-year period.

Interestingly, France is characterized not only by its crucial role as the place where family limitation first found a foothold, but also by the great diversity of the dates of decline among departments; at the beginning of the twentieth century, there were still departments with the m index of family limitation under 0.3. This situation can be contrasted with that of England, where the decline of fertility was highly grouped between 1890 and 1900 for the forty counties, including London.

The momentous revolution of family limitation began in two-thirds of the province-sized administrative areas of Europe during the thirty-year period from 1880 to 1910 (Figure 3). Moreover, the fertility decline took hold at much the same time in many areas of Western culture overseas, from English-speaking Canada to New Zealand. It is doubtful that this remarkable homogeneity can be explained by the influence of economic development on the independent motivations of millions of couples. Instead, it appears to be evidence that some diffusion of information on contraception, as well as some communication of normative beliefs, must have

FIGURE 3. *Starting dates of fertility transition in 700 European provinces, 1780–1969*

Number of provinces starting fertility transition as measured by a 10 percent decline in marital fertility, by decade

SOURCE: Coale and Treadway, 1979, fig. 7; reprinted by permission.

occurred within the larger European or Western, cultural sphere.

There are, of course, differences of timing among areas. Recent research on fertility decline in Europe persistently indicates that the onset and spread of the fertility decline appears to cluster regionally in a way that cannot be explained through common socioeconomic characteristics. There is greater similarity in fertility trends among provinces within the same region but with different socioeconomic characteristics than is true among provinces with similar socioeconomic characteristics but located in different regions. Provinces within regions typically share similar cultural characteristics, such as a common dialect or common customs. Regional boundaries often coincide with cultural boundaries, which in turn impede the flow of information and the process of diffusion. In addition, there are undoubtedly differences between cultures in terms of traditions, customs, and values that can either impede or facilitate the adoption of family limitation behavior and small-family norms.

The importance of language and other cultural boundaries in differentiating the timing and pace of the fertility transition is made starkly clear by the historical experience of Belgium, which is divided into Walloon (French-speaking) and Flemish (Dutch-speaking) areas. Maps plotting fertility during the transition period make clear that the areas with high marital fertility and a late decline are nearly all on the Flemish side, and those with an early and faster decline are on the Walloon side. Moreover, physical proximity was of no importance in areas where the two cultures met. An examination of a sample of paired communities, never more than ten kilometers apart but on opposite sides of the language border, reveals that although there were no significant meas-

urable social and economic differences between the communities, the language boundary was a real demarcation line between two obviously noninteracting demographic regions.

While the Belgian experience is impressive in indicating how the existence of a language border within even a small country can serve as a cultural barrier to the spread of the fertility transition, the experience of English-speaking countries overseas demonstrates the importance of language and culture in the fertility transition in a different way. The "extraordinary similarity between the course of birth rates in Australia and the United States, and the similarity between the fertility of these two societies over time and those of Britain, New Zealand, and English-speaking Canada" serve as one of the most striking manifestations of "the diffusion of fertility control practices within single-language groups" despite the quite different social and economic situations that characterized these countries (Caldwell and Ruzicka, 1978, p. 81).

Recent analysis of the fertility decline in the Soviet Union also underscores the importance of culture and tradition in determining the fertility response of a population to social and economic change. The persistence of customs and attitudes unfavorable to family limitation and reduced fertility appears to be the most likely explanation of why eastern minorities in Russia were so slow to reduce their fertility despite many decades of postrevolutionary social change, including the extension of education, the reduction of mortality rates, and massive indoctrination efforts. Similarly, long-standing cultural features seem to underlie the continuing persistence of high marital fertility and the absence of family limitation in the rural populations of Central Asia. Although a direct connection remains to be established, the subordinate position of women, which appears to be an entrenched part of the dominant Muslim culture of Central Asia, is probably a factor.

Summary. It may be helpful to rephrase the preceding discussion using the general framework developed by Richard A. Easterlin (1975). The determinants of fertility must work through (1) the demand for children, as determined by income, prices, and tastes; (2) the supply or potential output of children in the absence of fertility limitation, a function of natural fertility and the survival of children; and (3) the cost of fertility regulation, both psychic and objective. The historical record suggests the relative lack of importance of income and prices and determining the demand for children prior to or during early stages of the fertility decline. When target family size begins to be articulated, the dominant factor may be tastes, which may reflect external influences as much as or more than socioeconomic conditions specific to the society in question. In contrast to those who postulate a

role of declining infant mortality in hastening the resort to contraception to regulate the size of families, it is noted that the decline of fertility occurred among countries with very different supply functions, both in terms of overall fertility and in terms of childhood survival. Finally, it is believed that what is understood by the "cost of fertility regulation," a term that covers a variety of factors including sheer familiarity with the concept and means of family limitation, is an extremely important component of an explanation of the fertility decline as it occurred in Europe and as it will occur in many other parts of the world where high fertility now prevails. Here, too, the diffusion of attitudes toward and knowledge of contraception, and of contraceptive techniques and implements themselves, may trigger or accelerate the decline of fertility.

If this interpretation of the European transition from high to low fertility is correct, some of its early features can only be explained by a change in tastes or a decline in the cost of fertility regulation or some combination of the two. These features include the variety of social, economic, and demographic conditions under which the decline of fertility occurred; its remarkable concentration over time; the apparent coincidence of the decline with the sudden adoption of family limitation practices; the rapid generalization of such practices, once they appeared; the resultant drastic change of reproductive regimes; and finally, the importance of cultural factors among those that appeared to influence the onset and the spread of the fertility decline.

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See also DEMOGRAPHIC TRANSITION THEORY; FERTILITY DETERMINANTS; HISTORICAL DEMOGRAPHY.

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FERTILITY DETERMINANTS

1. PROXIMATE DETERMINANTS   John Bongaarts
2. SOCIOLOGICAL AND ECONOMIC THEORIES   Gavin W. Jones

1.

PROXIMATE DETERMINANTS

The proximate determinants of fertility are the biological and behavioral factors through which social, economic, psychological, and environmental variables affect fertility. The distinguishing feature of a proximate determinant is its direct influence on fertility. If a proximate

determinant, such as contraceptive use, changes, then fertility necessarily changes also (assuming the other proximate determinants remain constant), while this is not necessarily true for an indirect determinant such as income or education. Consequently fertility differences among populations and trends in fertility over time can always be traced to variations in one or more of the proximate determinants. The following simple diagram summarizes the relationships among the determinants of fertility:

Social, economic,
psychological,   Proximate
environmental $\rightarrow$ determinants $\rightarrow$ Fertility
variables

These relationships were first recognized in the mid-1950s when Kingsley Davis and Judith Blake (1956) defined a set of proximate determinants that they called the "intermediate fertility variables." Since that time, a somewhat different set has been defined, which has greatly simplified the task of constructing reproductive models; this set will be presented here.

Proximate determinants are easily identified by examining the events that most immediately influence the duration of the reproductive period and the rate of childbearing during it (see Figure 1). The potential reproductive years start at menarche, a women's first menstruation. Actual childbearing, however, is in virtually all societies limited to women in stable sexual unions. Since, with few exceptions, marriage (or first cohabita-

tion) takes place some time after menarche, one can in practice take marriage as the starting point of the reproductive years. In the absence of marital disruption, childbearing can continue until the onset of permanent sterility, which takes place at or before menopause.

While married and fecund, women reproduce at a rate inversely related to the duration of the birth interval, that is, short birth intervals are associated with a high birth rate and vice versa. In the absence of intrauterine mortality, the duration of a birth interval is determined by its three components. The first is the postpartum infecundable interval from birth to the first postpartum ovulation. During this period women are unable to conceive. The second is the fecundable interval (also called the ovulatory interval or the waiting time to conception) from the first ovulation to conception. During this period women are at risk of conceiving if they have sexual intercourse. The duration of this interval is determined by the monthly probability of conception, which is in turn determined by the "fecundability" (the monthly conception risk in the absence of contraception) and by the effectiveness of any contraception practiced. The third is a full-term pregnancy interval of nine months. In the event that an intrauterine death occurs, whether spontaneous or induced, the birth interval is lengthened by additional components: a shortened pregnancy, followed by a very brief infecundable period and an additional fecundable period (Figure 1).

This overview of the reproductive process thus identifies the following proximate determinants: (1) marriage (or first cohabitation) and marital disruption, (2) onset of permanent sterility, (3) the duration of postpartum infecundability, (4) fecundability, (5) use and effectiveness of contraception, (6) spontaneous intrauterine mortality, and (7) induced abortion. The first two of these factors determine the duration of the reproductive period and the latter five determine the rate of childbearing.

1. Marriage and marital disruption. The mean age at marriage of women varies widely among populations. In traditional societies in Asia and Africa, marriage takes place relatively soon after menarche and mean ages at marriage of around 17 years are not uncommon. In contrast, the mean age at marriage in a number of European populations is near 25 years. Correlated with the timing of marriage is the prevalence of permanent celibacy, that is, populations with a high age at marriage tend to have high proportions of women who never marry and vice versa. For example, in the most traditional developing countries virtually all women marry, but in developed countries the proportion of women single at age 50 often exceeds 10 percent.

Patterns of divorce and widowhood have changed rapidly in recent decades. While divorce was historically

FIGURE 1. *Events determining the reproductive life span and the rate of childbearing*

uncommon worldwide, it has increased rapidly in recent years in developed countries where now a relatively large proportion (in a few cases more than one-third) of all marriages end in divorce. The fertility impact of divorce is minimized by the rapid remarriage of the majority of divorcees. The trend in widowhood has been downward, as can be expected with declining mortality. The prevalence of widowhood was high historically in all nations. For example, in India in 1901 46 percent of women had been widowed by age 45. In contrast, only a few percent of women in the developed world now experience widowhood during their reproductive years.

The mean age at marriage and the prevalence of permanent celibacy and marital disruption are the main determinants of the average proportion of reproductive years women spend in marriage. In populations with early and universal marriage the proportion of the potential reproductive years lost is typically one-fifth or less, but this proportion can approach one half in populations with late marriage and a high incidence of permanent celibacy.

2. Onset of sterility. Menopause, the complete cessation of menstruation, marks the end of the potential childbearing years. In the United States and western Europe the age at menopause of individual women ranges from less than 40 to near 60, with averages in the late 40s. Only a few studies have been made in developing countries, and owing to various methodological problems, including recall errors and age misreporting, it is not clear whether a substantial difference in mean age of menopause exists between developing and developed societies.

Postmenopausal women are definitely sterile, but the onset of sterility can occur several years before menopause. The menstrual cycles become increasingly more irregular in the years before menopause, presumably reflecting a high incidence of anovulatory cycles. Also contributing to subfecundity among women over age 40 is the very high risk of spontaneous intrauterine mortality. In addition to these sterility factors for women, there is some (but lower) sterility among their husbands. The resulting couple sterility is estimated to reach 50 percent when women are in their early forties. This early age of onset of sterility is consistent with a mean age at last birth of around 40 years observed in many populations that do not practice contraception.

3. Postpartum infecundability. The duration of the anovulatory interval after a birth is usually estimated from the delay in the return of menstruation, that is, the interval of postpartum infecundability is assumed to equal the duration of postpartum amenorrhea. This assumption is apparently quite accurate when applied to the average interval in a population, even though in some women the first ovulation proceeds the first men-

struation while in other women the reverse occurs. It is now well established that the duration and pattern of breastfeeding are the principal determinants of the duration of postpartum amenorrhea. In the absence of breastfeeding the menses return shortly after birth, with average amenorrhea durations of 1.5 to 2 months. As the duration of breastfeeding increases, so does the amenorrhea interval—approximately one additional month of amenorrhea for each two months increment in breastfeeding duration. With long lactation, mean amenorrhea intervals from one to two years are observed in developed as well as in developing societies. Several studies (e.g., Lesthaeghe and Page, 1980) have found high levels of correlation between breastfeeding and amenorrhea durations, when comparing entire populations or subpopulations within countries. On the individual level the correlation between lactation and amenorrhea intervals, while still highly significant, is somewhat lower. The most plausible explanation for this, aside from measurement error, is that women differ not only with respect to the duration of breastfeeding, but also with respect to the type and pattern of breastfeeding. It has been demonstrated that women who fully breastfeed have a lower probability of resumption of menses than women whose infants receive supplemental food such as fluids by bottle or solids. The inhibiting effects of breastfeeding on ovulation and menstruation, as well as the differential impact according to the type and pattern of breastfeeding, are believed to be the result of a neurally mediated, hormonal reflex system stimulated by the child's sucking the breast nipple.

4. Fecundability. Fecundability equals the monthly probability of conceiving among women who menstruate regularly but do not practice contraception. Typical average fecundability levels among newlyweds range from 0.15 to 0.25 depending primarily on frequency of intercourse. Lower values are found at higher ages and longer durations of marriage. This monthly conception risk is substantially less than 1.0 because fertilization can only take place during a short period of approximately two days around the time of ovulation in the middle of a menstrual cycle. In addition some cycles are anovulatory and a substantial proportion (perhaps a third) of fertilized ova fail to implant, or else they abort spontaneously in the first two weeks after fertilization. These aborted fertilizations are usually not counted as conceptions in the demographic literature because they cause little or no disruption in the menstrual cycles and women are often unaware of such brief pregnancies. Levels of fecundability of around 0.2 imply that many women do not conceive for a number of months even if they have regular intercourse. Typical average delays to conception range from five to ten months.

5. *Contraception.* The prevalence of contraception varies widely among populations. The percent currently using contraception among women of reproductive age ranges from near zero in a number of developing countries with high fertility to around 75 in a few developed countries. The use of contraception affects fertility because it decreases the risk of conception. The effectiveness of contraception is measured as the percent of reduction in fecundability. For example, a contraceptive with an effectiveness of 90 percent used by a group of women with a fecundability of 0.2 will yield an actual monthly probability of conception of 0.02. Contraceptive effectiveness depends on the method as well as on the motivation and knowledge of the user. In developed countries, the effectiveness of modern methods such as the pill and intrauterine device (IUD) is more than 95 percent, and the effectiveness of conventional methods such as the condom, diaphragm, or spermicides is around 90 percent. Those levels are believed to be lower in developing societies, but reliable information about effectiveness in these populations is virtually nonexistent.

6. *Spontaneous intrauterine mortality.* Estimates of the risk of intrauterine mortality have proven difficult to make. Retrospective reports of pregnancy histories of individuals are known to be deficient because of recall errors, but estimates based on prospective studies also vary. This is in large part the result of difficulty of obtaining accurate reporting of intrauterine deaths in the early months of pregnancy when it may not be easy to distinguish between a delayed menstruation and an early spontaneous abortion. The most carefully designed studies estimate that about 20 percent of conceptions will not end in a live birth (not including embryonic deaths occurring before the first missed menstruation), and that nearly half of these spontaneous abortions occur before the third month of pregnancy. This estimate of 20 percent is an average for women of all ages. The risk of intrauterine mortality is lowest in the mid-reproductive period and much higher than average for women in their late thirties and forties. The available evidence does not

suggest large differences in the risk among societies. However, the probability of a still birth (an intrauterine death after the twenty-eighth week of gestation) is around 4 percent of conceptions in some poor countries while it is only about 1 percent in the most developed countries. The reasons for this difference have not been determined conclusively, but health and environmental factors presumably play an important role.

7. *Induced abortion.* Deliberate interventions to terminate pregnancies have been practiced throughout recorded history. In the late 1970s, the proportion of pregnancies ended by induced abortion ranged from near zero to more than a third in a few eastern Europe countries. The availability of simpler medical techniques, assurance of personal safety, and ease of access have recently increased in many countries. Even where these conditions are not present, as in much of the developing world, the determination to avoid childbirth leads women to resort to induced abortion. [*For a detailed discussion, see* ABORTION, *article on* INDUCED ABORTION.]

Each of these seven proximate determinants directly influences fertility, and together they determine the level of fertility. In studies of fertility levels or differentials it is generally not necessary to devote the same effort to analyzing and measuring each of the proximate determinants because they are not of equal interest. Two criteria can be applied to select the proximate determinants that deserve most attention. The first is the sensitivity of the fertility rate to variation in a determinant; it is relatively uninteresting if large variation in it produces only a minor change in fertility. The second criterion is the extent of a determinant's variability among populations or over time. A relatively stable determinant can contribute little to explaining either trends or differentials and hence is less important.

In Table 1 the seven proximate determinants are given an approximate rating for these two criteria. Studies with reproductive models (e.g., Bongaarts, 1976) show that fertility is least sensitive to variations in the risk of spon-

TABLE 1. *Rating of proximate determinants with respect to sensitivity of fertility and variability among populations*

Proximate determinants	Sensitivity of fertility to the determinant	Variability among populations	Overall rating
1. Marriage and marital disruption	+ + +	+ + +	+ + +
2. Onset of permanent sterility	+ +	+	+
3. Postpartum infecundability	+ +	+ + +	+ + +
4. Fecundability	+ +	+ +	+ +
5. Contraception	+ + +	+ + +	+ + +
6. Spontaneous intrauterine mortality	+	+	+
7. Induced abortion	+ +	+ + +	+ + +

+ + + = high.   + + = medium.   + = low or absent.

taneous intrauterine mortality, and most sensitive to changes in the proportions of people married and the prevalence of contraception. Variability is lowest for onset of sterility and risk of spontaneous intrauterine mortality. The overall rating, based on both criteria, indicates that four proximate determinants—marriage, postpartum infecundability, contraception, and induced abortion—are the most important for the analysis of fertility levels and trends.

<div align="right">John Bongaarts</div>

For related information, see REPRODUCTION, *article on* MODELS; BREASTFEEDING. *See also* REPRODUCTION, *article on* MALNUTRITION AND FAMINE.

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2.
SOCIOLOGICAL AND ECONOMIC THEORIES
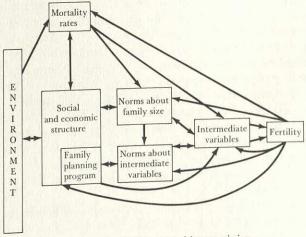
Research into the determinants of fertility has used both macrodata, aggregated by country or by regions within a country, and microdata, collected from individuals and households. Studies of macrodeterminants have tended to focus on a limited number of development indicators as explanatory variables; the correlations identified do not readily translate into causal linkages and mechanisms. Such studies do not normally examine the structural characteristics of society. Studies of microdeterminants normally follow one of only three basic conceptualizations of fertility decision making: the economic model, the sociological model (of which anthropological approaches can perhaps be considered a subgroup), or the psychological model. This article deals with the first two of these, paying attention to the extent to which theories (1) have general applicability across societies and (2) deal with the individual calculus of costs and benefits and societal constraints.

There are important differences between the disciplines of sociology and economics that have affected their conceptual frameworks for studying fertility. Sociologists

stress societal constraints on individual decision making, acting through norms and the formation of taste; economists stress individual maximization of utility (which means welfare or happiness or satisfaction) through choices between alternate possibilities with respect to scarce resources and time. There is more than flippancy in the statement that economics is about how people make choices and sociology is about why they do not have any choices to make.

Sociological Framework. For sociologists the unit of fertility analysis may be the whole society, strata or groups within the society, or a reproducing couple classified in terms of psychological characteristics that cut across social categories. The broad questions raised by previous efforts to refine the theory of the demographic transition required comparative studies of different societies or of one society at different points in time. Intrasocietal differences are important, and the fertility decision in all instances is made ultimately by the individual couple. But "the problem is not why one couple rather than another is at a particular place in the frequency distribution of births in a society, but why the society as a whole has the particular frequency distribution that distinguishes it from another" (Freedman, 1975, p. 10).

As a general framework for the sociological study of fertility, the model developed by Kingsley Davis and Judith Blake (1956) has been very influential. Ronald Freedman's diagram, based on this model and reproduced as Figure 1, envisages environmental factors and social and economic structure impinging on fertility via a series of intermediate variables (e.g., age at marriage and practice of contraception). Their effect on these intermediate variables is mediated through their effects on norms (e.g., beliefs about the appropriate age to marry). Partial

FIGURE 1. *A model for the sociological analysis of fertility levels*

SOURCE: Freedman, 1975, p. 15; reprinted by permission.

studies of fertility determinants might refer to the influence of environmental or social and economic factors on one or more of the intermediate variables, to the influence of one or more intermediate variables on fertility, or, ignoring the intermediate stages, to the influence of environmental or social and economic factors on fertility (e.g., through multivariate analysis of cross-sectional data). The important thing about the framework is that it helps to systematize the study of fertility and draws attention to the fact that, even where the intermediate variables are not considered in a particular analysis, they are necessarily the proximate determinants of fertility.

While some scholars have emphasized the importance of societal constraints on fertility, others have argued that a shift from societal to individual control occurs over the course of the demographic transition. Jean Bourgeois-Pichat argues, for example, that "fertility in pre-industrialized societies . . . is determined by a network of sociological and biological factors and when the network is known, the result can be predicted. Freedom of choice by couples is almost absent. The couples have the number of children that biology and society decide to give them" (1967, p. 163). For example, large numbers of young people in India, the Muslim countries, and elsewhere marry a spouse chosen by their parents at an age chosen by their parents and determined by convention. Convention also decrees that the first child be born as soon as possible after marriage and that the wife will lack any standing until this happens. Timing of the first birth more or less predetermines the timing of subsequent births. As the demographic transition progresses, however, having a child becomes increasingly the result of the couple's free decision.

E. A. Wrigley (1969, p. 192) makes a similar distinction between "social sanctions," which operate to restrict fertility in a preindustrial situation, and "family sanctions," which operate in a modernized society. Others have classified fertility regulation into phases of biological and social controls, on the one hand, and deliberate individual control on the other. Frank Lorimer et al. (1954) hypothesized that societies emphasizing unilineal (either patrilineal or matrilineal) descent and having corporate kinship groups tend to generate strong cultural motives for high fertility; and that cohesive groups, such as extended families, tend to enforce conformity to societal norms, which often, though not always, favor high fertility. Such corporate kinship groups and extended families tend to break down over the course of economic development, implying a weakening of societal constraints on individual decision making.

It is widely accepted that the extended family encourages high fertility, but very few studies adequately test the proposition. Along with growing recognition that the residential extended household is less prevalent in developing countries than was previously thought, there is increasing awareness that the form of the residential household might not be as important from the point of view of fertility determination as the network of kin involving mutual interaction (Lorimer et al., 1954) or, in John C. Caldwell's terms (1977), the "extended family of mutual obligations." Much more research is needed in this area. Many investigators would deny the sharp break between the relative importance of social and individual control as society moves from a preindustrial stage to a modern economy, stressing rather the changing social and economic context within which individual decision-making, rational within that context, is carried out.

What demographers and sociologists have provided, then, is a broad descriptive framework and a number of *ad hoc,* partial explanations of fertility levels and trends, characterized by an eclecticism seen by some as a standing rebuke to the profession and by others as simply consistent with the complexity of the phenomena being studied. New ideas and approaches were needed, and economists have recently contributed a number of them.

Economic Frameworks. In the vast literature that has emerged in the last fifteen years on the economics of fertility, two major schools of thought can be identified: the "Chicago School" (or "new household economics" or "demand theory") approach and the "socio-economic" approach, identified primarily with Harvey Leibenstein and Richard A. Easterlin. The demand theorists, and to a lesser degree others writing on the economic determinants of fertility, have applied their theories primarily to Western, urbanized, industrialized societies and made little effort until very recently to discover whether they bear on the realities of peasant life in developing countries. Nevertheless, it is presumed that the theories have general applicability and therefore it is not altogether unfair to evaluate their relevance to developing as well as to developed countries.

The demand theory. The "demand theory" or "new household economics" approach to fertility is a development in the theory of consumer choice that is based on recent developments in four areas of economic analysis (see Theodore W. Schultz, 1974, pp. 6–8): the investment in human capital; the treatment of human time as it is allocated to both market and nonmarket activities (Becker, 1965); the household production function (Becker, 1965); and a view of the family that encompasses both consumer choice and decisions on household production, including the bearing and rearing of children.

The family, according to the new household economics, is a decision-making unit that maximizes its utility in consumption as well as in allocating human time and

goods in the production activities of the household. A basic constraint facing the household (or the married couple) is the time available to the couple for consumption or production activities. Childbearing and the rearing of children demand a significant amount of time. Thus if parents choose to have children they must, it is argued, have weighed the psychic rewards from bearing and rearing children against the rewards from other activities that might have been undertaken instead. The "opportunity costs" of having children will differ for each couple, depending on the constraints they face. For example, the college-educated woman who chooses to raise children may be forgoing the substantial income she could have been earning in a profession, or the time for intellectual pursuits, whereas the high school dropout faces a different set of opportunity costs.

The theory of fertility derived by the Chicago School rests on the premise that, from the point of view of parents, children are durable goods, yielding satisfaction over a protracted period of time and in this sense comparable with other goods such as motor cars or television sets. Many are troubled by the notion of children as consumer durables. Bernard Berelson (1972), for example, notes that children "come only in whole units, they are not rentable or returnable or exchangeable or available on trial, they cannot be evaluated quickly, they do not come in several competing brands or products, their quality cannot be pretested before delivery, they are not usually available for appraisal in large numbers in one's personal experience, they themselves participate actively in the household's decisions" (p. 22). But for many economists, the problem in considering children to be consumer durables is that available evidence shows that higher-income groups generally "buy" fewer children than lower-income groups and that average family size declines over the course of economic development. This leads to the conclusion that children must be "inferior goods," of which, like potatoes, fewer are bought as incomes rise. To explain this paradox, Gary S. Becker (1960) first noted that lower-income countries (and groups) might lack access to contraceptive means and therefore "consume" more children than they intend to. More importantly, he argues that the number of children would normally rise with income except that this income effect is offset by a countervailing price effect: namely, that with rising income, children of higher "quality" are desired. The number of children parents have is not determined independently of the "quality" of children they choose to have.

In later writings the demand theorists sought to explain the "inferior goods" paradox by incorporating additional elements into the theory. Noting that the opportunity cost of the mother's time rises sharply as her education rises (Mincer, 1963), they argued that expenditure of time on children must be included along with expenditure of income. Children limit the participation of the mother in the labor force; the mother is more likely to wish to work in situations where her income potential is higher; better-educated women, who on the whole are in the higher-income groups, have higher income potential and hence a higher opportunity cost of minding children. Moreover, as family income rises, the couple give greater emphasis to those goods and services that compete more directly with children for time.

There is disagreement whether Becker's "household production function" clarifies or obfuscates the issues, but it is fundamental to an understanding of the issue of "child quality," which plays a key role in the Chicago School's view of fertility. Building on the notion that it is the characteristics that goods possess, rather than the goods themselves, that yield utility to the consumer, Becker's household production function takes market goods (including children) as inputs. These inputs are combined in the home with time supplied by household members to produce the characteristics that directly enter the utility functions of the members. For example, food purchased in the market, when cooked by the wife, yields meals; the house, cleaned and swept, yields satisfactions that an untidy house would not; children taught to speak correctly, to play the piano, and to understand the new math yield satisfactions which "low-quality" children would not. The concept of household production provides some intuitive insights and a more direct integration of household time and nonpurchased inputs with commodities purchasable on the market in the production of utility-yielding characteristics. Robert A. Pollack and Michael L. Wachter (1973), however, argue that because there is no operational concept of "commodity" this approach introduces at best an unnecessary and at worst a misleading additional concept into the tradiional chain linking utility directly to market goods and time.

Treatment of the mother's time is undoubtedly a significant contribution of the new household economics. The contribution is clouded, however, by the obscureness of the concept of the household production function and the failure to develop an exhaustive classification of the uses of women's time at home, in particular the failure to isolate their home production of goods for sale from other categories of use of their time at home. Jacob Mincer first argued that women's "home time" should be divided into work at home and leisure. Even this distinction was largely ignored in subsequent writings by Mincer and others, though Reuben Gronau (1976) has restored it, showing the value of dividing women's time into three categories: market work, work at home (i.e., work-gener-

ating services having a close counterpart in the market), and leisure, which has only poor substitutes in the market. The predictions of Gronau's model are that the wage rate and work at home are negatively correlated (so that work at home decreases as wage rate increases), whereas the effect of a change in the wage rate on leisure depends on the relative magnitudes of the income effect and the substitution effect.

Finally, T. Paul Schultz and his colleagues have noted the complications introduced by falling levels of childhood mortality, which tend to result in lowered fertility where parents desire a certain number of *living* children (e.g., Schultz, 1969, 1976a, 1976b). But this aspect was already well covered by the "mainstream" demographic analysis of fertility determinants and is not a central contribution of the demand theory of fertility.

The goal of the microeconomic theories of fertility is to explain variance in completed family size at the level of the individual couple. The list of new variables suggested by the demand theorists is lengthy and interesting, but as noted by Boone A. Turchi (1975), the theoretical formulations do not correspond with the empirical tests undertaken, largely because little effort has been made to collect survey data of the kind needed to test the presumed relationships adequately. The heavy emphasis on econometric modeling and reliance on the existing restricted and lopsided empirical data base meant that the specifications of the models were also restricted and lopsided (Demeny, 1976, p. 126). The danger is that policy options considered for changing fertility will be as narrow as the range of variables whose influence can be tested in the models. These come down to only six (after elimination of variables whose explanatory power is insignificant): women's education, men's education, women's wage, men's wage, family income, and infant mortality. The identification of these variables as being apparently causally related to fertility can hardly be considered a great advance in theory, since their importance was already recognized by what Demeny refers to as the "commonsense economics of fertility."

Many criticisms have been leveled at the demand theory of fertility. Some attack the assumption of rationality, but Leibenstein has argued persuasively that the theory does not require an assumption that all parents make rational decisions about *all* children, so long as behavior of most parents at critical junctures is rational. It is not unreasonable to argue that most parents take into account the utilities and disutilities they associate with a marginal child, that is, presumably the last child they have or the child they begin to wonder about whether they should have (Leibenstein, 1975, pp. 2–3).

A more serious defect may be the simplifying assumption that couples adopt at the outset of marriage a util-

ity-maximizing plan for childbearing, for expenditures of time and money on children and other activities, and for the wife's participation in the labor force. This assumption is analytically convenient but empirically quite unjustified, since decisions about having children (to the extent that they are made at all) are probably sequential, and the goal for family size only stabilizes after childrearing has begun.

The Chicago School has major difficulties with changing tastes (or, in economic jargon, shifts in the underlying preference utility surface), and the complications they pose for theories based on "pure" economic rationality. Tastes conceptually "have become a kind of microeconomic error term used to explain the residual variation in consumer behaviour which cannot be explained by measured income and various proxies for price" (Robinson, 1979, p. 9). Introduction of the value of time as a key explanatory variable goes some way toward explaining that part of the differential in fertility which might otherwise have been attributed to taste. Nevertheless, it is not valid to assume that remaining differences in tastes will simply fade away as a more complete and sophisticated battery of economic factors are introduced as explanatory variables. The available evidence is compelling enough to assert that fertility transition has a good deal to do with the diffusion of altered tastes across barriers of geographical location, class, culture, and time. Moreover, it is doubly unwise for economists to treat tastes as given, because tastes are undoubtedly related to a key economic variable—income—in complex ways, ways that almost certainly change over time and with changes in economic structure.

Another important weakness in the demand theory of fertility—surprising in a theory developed by economists—is its neglect of the supply side. Thus it is not a complete theory; it has nothing to say about situations where demand for children does not exist, for example, in most situations of extramarital or premarital fertility. The demand theorists also ignore the important constraints on the supply side imposed by the inability of a substantial proportion of parents to attain their desired number of children because of biological factors. Unless such factors operate equally across subgroups in the population over time, which seems most unlikely, it is quite clear that they influence fertility differentials and trends independent of the explanatory variables normally used.

The emphasis on econometric modeling has perhaps also tended to lead the demand theorists to attribute small differences between classes or groups in cross-sectional data to differences in their economic prospects and status rather than to lags in transferring fertility patterns from one class to another. Such lags may be the result of initial differences in tastes or in the efficacy of fertility

control practices, neither of which are recognized as existing by most demand theorists. The diffusion effect across cultural boundaries, prominent in the current understanding of the European demographic transition, cannot effectively be captured by multivariate analysis based on cross-sectional data. The econometric modeling that treats living children as "good" and skips over the sociologists' intermediate variables also ignores the complication that the intermediate variables have an independent role in people's decision making. Whether to marry, and if so, when, is an important decision variable in itself, and the demand for children is not the only or even necessarily the key influence on the decision. Similarly, people in many circumstances value divorce, or coitus, or religious customs affecting abstinence as good in themselves, not only for their role in achieving a desired number of children.

With regard to the efficacy of the theory for explaining fertility behavior in low-income countries, Theodore W. Schultz (1974, p. 20) notes that

the household model as it now stands has not been developed to treat the particular classes of circumstances that constrain the household in these countries. These are countries in which illiteracy abounds, human time is cheap and the income opportunities that women have outside the home are mainly not jobs in the labor market. Furthermore, infant mortality is high, life expectancy at birth is low, debilitation during the adult years is substantial for reasons of inadequate nutrition and endemic diseases, and the availability of modern contraceptive techniques, including information about them is, in general, wanting. These classes of circumstances are not as yet at home in the household model.

Six other key reasons why the household model of fertility is not readily applicable in low-income countries can be mentioned. First, child-care assistance with an almost zero opportunity cost is commonly available within the household, in the form of servants, older children, or other relatives. Moreover, many market activities in which women engage can satisfactorily be combined with child-care. Second, the variants of the demand theory of fertility where the price effect depends on the value of the mother's time are highly culture-bound. In some cultures, women are secluded in the home, and work outside it is not a real option for the great majority. The level of female participation in the labor force varies enormously between different developing countries with comparable economic conditions.

Third, the concept of "household utility maximization" is even further divorced from reality in many developing countries than in the West, because of household structure and the network of mutual obligations with kinfolk. Individuals maximize their utility often at the expense of other household members. For example, in

some cultures the dominance of the patriarch is so great that we can think of his preference function as identical to that of the household and therefore as determining fertility within the household. This is by no means true, however, in all low-income societies.

Fourth, in many developing countries, children's role as "consumer durables" is outweighed by their role as productive agents and as a source of security for the future. John C. Caldwell (1978), in fact, asserts that the point where the net intergenerational flow of wealth shifts toward the child from the parents is the point at which serious efforts to limit the number of births begin to be made.

Fifth, in many developing countries the "supply constraint" looms large. There is a section of every population whose natural fertility (i.e., their fertility in the absence of deliberate practice of family limitation) is below their desired fertility, perhaps because of sterility or less than normal fecundity or because of certain practices, such as a taboo on intercourse while the mother is breastfeeding, that inadvertently lower fertility. The proportion of the population in this category varies greatly, from a low of perhaps 5 to 10 percent (the sterile or less than normally fecund in Western societies who would like more children than they can have) to 40 or perhaps even 50 percent in areas such as the low-fertility belt in Central Africa, where factors including the prevalence of venereal disease lead to very high levels of primary sterility.

Sixth, the continuing high fertility levels in many developing countries and sharp declines in fertility in others, apparently not closely correlated with attainment of universally applicable "threshold" levels of socioeconomic development, raise the whole question of society-wide shifts in "tastes" for children, something the demand theorists consider a Pandora's box, which they are unwilling to open.

Formerly, the applicability of the demand theory of fertility to a large section of the population of developing countries may have been restricted by ignorance of methods of fertility control or inaccessibility of contraceptive methods. This is no longer as true, since family planning programs are reaching out to remote areas of countries such as Indonesia and Bangladesh, bringing modern methods of birth control unknown during the demographic transition in Europe; and village marketing networks are responsive enough to demand to spread contraceptives through the country if the profit potential is evident. Nevertheless, there remains a financial or psychic cost or both in the use of contraception, which needs to be explicitly integrated in the theory.

The socioeconomic approach. Leibenstein (1974; 1975) sees as a major inadequacy of the demand theory the

unlikelihood that the price effect is significant enough to explain the negative relation between divergent income groups and fertility. He opts for an explanation that takes account of the relation between social status and tastes. Economic changes (e.g., a sharp rise in a family's income) influence the social status of families. As a consequence of this change, tastes also change, not only for children but simultaneously for goods that compete with children and for goods and services involved in the nurture of children. The costs of raising children are related to the socioeconomic reference group of the parents, therefore a husband's *relative* income is more important than his *actual* income in determining a couple's fertility. Given the social status of a family, it has only limited control over the costs of its children. Related to this, Leibenstein sees education as significant in itself (through its effects on tastes) rather than as affecting fertility indirectly through its effect on the value of time, as in some variants of the demand theory of fertility.

Leibenstein's theory is heavily based on the notion that changing social status exerts a kind of ratchet effect: people are eager to enter higher-status groups but are very loath to drop in status. Thus expenditure patterns characteristic of lower-status groups are not seen as a real option. Many status-related expenditures increase in usefulness at the margin in the sense that only when the item in question (a house, for instance) is of a certain quality, and hence requires a certain level of expenditure for its purchase, is the expenditure considered useful in demonstrating status. The elasticity of demand between people of various status groups is high, and it is reinforced as income differences between different status groups are reduced in the course of socioeconomic development.

Combining these considerations of the cost of useful expenditure with the decline of the usefulness of more than one or two children in a developing economy, Leibenstein's model shows that generally fertility will steadily decline as a result of economic development.

Easterlin follows Leibenstein in attempting to build an economic theory of fertility that not only takes advantage of the strengths of economists in analyzing optimizing decision making by individuals subject to constraints, but also takes account of the demographic-biological realities of demographic transition and the contributions of sociologists to the theory of fertility determination (1975; Easterlin, Pollack, and Wachter, 1980). He argues that the Chicago School's deemphasis of tastes and "supply" factors (i.e., the production of births) severely limits the empirical relevance of their theory. In societies where most of the population are subject to natural fertility, making no attempt to control births, and an important proportion are less than normally fecund, differences in achieved fertility may primarily reflect natural fertility rather than desired family size.

Subject to a few simplifying assumptions, Easterlin classifies households into four groups on the basis of the determinants of their fertility.

In Group I, natural fertility is less than or equal to desired fertility. There is therefore no motivation to limit fertility. In Groups II, III, and IV, all households have a motivation to regulate fertility because their natural fertility would result in more than the desired number of births. Whether they practice fertility control depends on its economic and psychic costs and benefits. (Easterlin terms these psychic costs "preference drawbacks.")

For Group II, the costs outweigh the benefits, and no deliberate control is practiced. For Group III, the benefits of fertility regulation outweigh the costs, and these families practice fertility control. But the costs are such that these families have "excess fertility," that is, more births than are desired. For this group, preferences for commodities and children and such constraints as the biological capacity to produce children, infant mortality, budget limitations, and the household's technology help determine actual fertility. For Group IV the costs of fertility control are so low relative to motivation for control that the group regulates its fertility to the point where actual births are equal to desired births. This is the "perfect contraceptive society."

In most societies, one could expect a distribution of households ranging from Group I to Group IV. But, Easterlin argues, in many developing societies, there is little practice of deliberate fertility control, which means that most households fall in Groups I and II. To explain their behavior, models stressing natural fertility and ignoring preferences for children are appropriate. For those who deliberately control their fertility, models emphasizing preferences for children and the effects of prices and income on desired family size are appropriate. The relationship between socioeconomic status and fertility could be governed by different mechanisms in the different groups, and attempts to analyze the fertility behavior of an entire population without distinguishing between those who deliberately regulate their fertility and those who do not may result in biased estimates of the response of fertility to changes in socioeconomic status or to access to modern techniques of fertility control.

The Leibenstein-Easterlin family of models approach more closely the reality of developing countries than do the Chicago School models, though more so with regard to biological aspects of fertility than with regard to familial and societal structures influencing fertility. However, they are also subject to a number of drawbacks. For example, irrespective of how nearly they come to explaining the fertility of individual married couples, changes in societal fertility levels or differentials among societies are also the result of the extent of marriage, age at marriage, and marital dissolution patterns, which are not treated in

the model. Costs of fertility regulation are treated mainly in relation to modern methods of fertility control, without attention to the gray area of traditional practices and taboos that intentionally or unintentionally influence fertility. As with the demand theory of fertility, the socioeconomic theories have yet to come to grips with the complex question of temporal changes in family power structure and their effects on fertility decision making emphasized by Caldwell (1977, 1978). The socioeconomic theories of fertility are still evolving and still constitute more a conceptual framework than a testable model.

To sum up, the two main schools in the economics of fertility differ mainly with regard to how narrowly economic is the focus of their model. The Chicago School hews to a rigorously economic, income-and-prices framework with the couple as the unit of analysis, and it stands or falls on the "quality of children" argument in explaining the declining demand for children as incomes rise. By allowing an explanatory role for shifts in tastes, the socioeconomic school is more open to the insights of sociology and pyschology and has greater potential for explaining the forces making for high fertility in many developing countries and the timing of the onset of fertility decline. Its model, however, becomes more complex and less readily testable.

In many parts of the world, parents still find children an important source of wealth, prestige, power, and security. Economic theories of fertility have tended to place more emphasis on analyzing the costs of, rather than the returns from, children. Adequate analysis of the returns from children will require attention to the insights of disciplines such as psychology and anthropology. Even within the traditional confines of economics, application of consumption theory will have to be combined with an approach based more on investment theory (perhaps using the work on investment in human capital, especially education, as its starting point). Elements of the theory of risk and uncertainty are also needed, since neither the chances of a baby's survival to adulthood nor the way it will turn out as a person or as a productive agent are known in advance. Indeed, among poverty groups in developing countries, it can be argued that an appropriate economic theory of fertility would emphasize survival itself and the minimizing of risk rather than the usual approach of maximizing benefits in a context in which survival itself is not seen to be at stake.

Conclusions. Ideally, decisions about fertility should be examined within a single general framework that accounts for both individual calculus of costs and benefits and the social constraints. There is undoubtedly potential for the economic and sociological approaches to fertility determination to be brought closer and enriched by each other's insights. Both postulate a rational and sys-

tematic effort to achieve goals subject to certain constraints. It is on the nature of the constraints that the disciplines diverge. Neoclassical economics has always emphasized the individual as the unit of analysis and maximization of the individual's utility function as the objective. Tastes have normally been considered a given, though in fact the insights of sociology and psychology can be harnessed to integrate taste formation into the theory. Sociology and anthropology pay more attention to group survival, societal goals, and normative elements, which in fact narrow the scope for (and, it might be added, burden of) individual decision making. Realization by the extended family, larger groups, and the whole society that microdemographic processes have far-reaching consequences leads them to involvement in the essentially individual process of procreation through the establishment of norms reinforced by sanctions and rewards. Through this mechanism, optimizing behavior by individuals is made to adhere more closely to what society considers its best interests; but within those constraints, sociologists do not deny that individuals attempt to maximize their own welfare.

A framework broad enough to encompass all the diverse factors impinging on fertility necessarily loses specificity for particular situations. Theories and models, if they are to help very much in understanding and, especially, in measuring the strength of factors influencing fertility, must be designed with particular contexts in mind. Cultural patterns, value systems, and class relations are not explicable merely by the stage economies have reached; rather they have an independent history of their own and an independent effect on marriage patterns and natural fertility as well as on the perceived value of children (Jones, 1977, pp. 30–34). General forces influence fertility everywhere, but they are so strongly mediated by the particular social setting that the search for a general theory may best wait upon an improved understanding of the determinants of fertility levels and trends in Singapore or rural Bangladesh or Nigeria or Guatemala, or finally in middle America, where some would argue the demand theory of fertility does tolerably well.

Gavin W. Jones

See also FERTILITY AND DEVELOPMENT; FERTILITY DECLINE; VALUE OF CHILDREN.

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FERTILITY TRENDS

The following article is limited to a discussion of fertility of women in the United States since 1917, focusing on determinants of fertility and the role that unintended births played during the period under discussion. Discussions of these issues with regard principally to developing countries can be found in FERTILITY AND DEVELOPMENT *and, with regard to both developed and developing countries, in* FERTILITY DECLINE. *Related material can be found in* FERTILITY DETERMINANTS *and in* VALUE OF CHILDREN.

This is an account of American fertility since 1917, during which time the record is available in sufficient detail for sophisticated analysis. The principal trends are identified for the various dimensions of the fertility behavior of birth cohorts of women. Period-specific manifestations are outlined, with special emphasis on the era that followed World War II.

The crude birth rate in 1917 was 28.5 per 1,000 popu-

lation at midyear. It declined to 18.4 in 1933, rose to 25.3 in 1954 (although there was a one-year spike of 26.6 in 1947), and declined to 14.8 in 1976. It has risen slightly since, to an estimated 15.8 for 1979. From the perspective of the preceding century of continuous decline from a value in excess of 50, the remarkable feature of contemporary history is not how low the birth rate is now so much as how high it was in the 1950s. The principal challenge in analysis of the time series is the explanation of that decade's so-called baby boom, and implictly the likelihood of a recurrence.

Total Fertility Rate and Mean Age of Childbearing. For those concerned with the consequences of reproductive behavior for the size and growth of the population, the crude birth rate has especial importance because it is the most volatile component of the growth rate over time. Similarly it is the focus of attention for those studying the consequences of reproductive behavior for the age distribution, because changes in the crude birth rate indicate changes in the size of successive birth cohorts and therefore the future configuration of the population by age.

If, on the other hand, the purpose is to analyze temporal variations in fertility, with a view to understanding their determinants, other kinds of measures become appropriate. In the first place, one can think of the crude birth rate as a weighted average of the reproductive behavior of women of different ages in the year in question, where the weights are the proportions of the total population those age groups represent. This weighting system can be considered, to a good first approximation, as an echo, with a lag of one generation, of the birth rates of the past. A trough in the birth rate tends to be followed by another lesser trough a generation later, because of the shortage of potential parents it implies; the converse is true for a peak. In order to analyze reproductive behavior without the influence of this past history, and to focus more squarely on current behavior, the conventional procedure is to calculate a period total fertility rate, the sum of the age-specific fertility rates. The result can be interpreted as the mean number of births per woman that would occur if the experience of a lifetime were to correspond with the birth rates recorded age by age in the period in question. The mode of calculation guarantees that the result is arithmetically independent of the age distribution of the population. The period total fertility rate declined from 3.33 per woman in 1917 to 2.15 in 1936 and then rose to 3.68 in 1957. Since that time it has declined to an estimated 1.77 in 1979.

The period total fertility rate in turn has its own particular flaw, reflecting its synthetic nature; each component of the rate is contributed by a different age group of women. These groups represent different birth cohorts, and each birth cohort has its own record of fertility age by age. One can accordingly calculate a total fertility rate for each cohort, although some estimation is required to complete the record for cohorts at intermediate ages in the current period. For the cohort of women born in 1891 (say cohort 1891) the value was 3.03. It declined to 2.27 for cohort 1908, rose to 3.22 for cohort 1933, and finally declined to an estimated 1.92 for cohort 1950. Although the broad outlines of change are the same as before, there is substantial difference in detail.

The discrepancy between the time series of period and cohort total fertility rates arises from changes in the time pattern of childbearing. A shift to a younger pattern of childbearing raises the period rate, while a shift to an older pattern lowers it. Technically speaking, if all cohorts distributed their childbearing identically, the value of the total fertility rate for any period would simply be a weighted average of the total fertility rates of the constituent cohorts, where the weights (the proportion of completed fertility that each cohort allocates to that period) would add up to 100 percent. But with any variation in the distributional pattern from cohort to cohort, the sum of those weights tends to depart from 100 percent, producing period total fertility rates that are positively or negatively distorted versions of the underlying cohort values. To a very close approximation, the magnitude of this distortion is the complement of the annual change in the cohort mean age of fertility (the mean of the distribution of fertility rates by age).

Stated more simply, if cohorts are having their children at progressively later ages, there will be fewer births per year and the period rates will fall, even if all cohorts ultimately have as many children as before. And conversely, when cohorts are having their children at progressively earlier ages, this trend packs more births into each period and raises the period rates. Thus the 1936 trough in period fertility was deeper than the trough in cohort fertility because the mean age of cohort fertility was then rising; the 1957 peak in period fertility was higher than the peak in cohort fertility because the mean age was falling. Currently the mean age of fertility is rising again, and the level of period fertility is deflated below that for the comparable cohort.

Thus movements of the period total fertility rate derive from two distinct sources. Superimposed on (1) movements of the cohort total fertility rate are distortions associated with (2) movements of the cohort mean age of fertility. The contribution of distortion is major. In the contemporary American record, changes in the quantity of cohort fertility have had less effect on changes in the quantity of period fertility than have changes in the time pattern of cohort fertility. Accordingly, the task of analysis begins with that time pattern.

Entry into Motherhood. In an algebraic sense, the mean age of fertility can be considered as determined by the age at which motherhood begins, and the length of the average interval between successive births (the latter multiplied by the number of those intervals). For contemporary American experience, variation in the number of births has been small; moreover, those who have more birth intervals tend to have shorter ones, which keeps their mean age of childbearing closer to the general average. In short, the dominant influence on the time pattern of cohort fertility has been the mean age of entry into motherhood.

The time series of that parameter, for cohorts 1891–1950, shows a large fluctuation superimposed on a pattern of decline. The trend values for the series are 23.8 for the beginning point and 22.4 for the end. Although marriage data for the United States are not of the quality of fertility statistics, it is clear that the age at first marriage has followed a comparable path to the age at first birth, as one would expect. In one sense a long-term decline in the marriage age is surprising. It is known that those who complete their education with graduation from high school tend to marry about two years later than those who fail to go that far, and about two years earlier than those who go on to college. It is also clear that education has substantially increased throughout the twentieth century. From these observations it would seem to follow that the age at marriage should have risen. The contrary outcome has been produced by a shortening of the interval between leaving school and marrying, which has more than counterbalanced the negative effect of additional schooling.

Although the complete explanation for the shorter time between school and marriage is likely to be complex, two circumstances may have improved the efficiency of the marriage market. One is the high school. So long as the school-leaving age was below the age of sexual awareness, school enrollment was generally irrelevant to nuptiality. The situation becomes radically different when a considerable majority of boys and girls remain in school until age 18. The American high school has all the requisites of an institution designed to promote mating. Single males and females are assembled in substantial and equal numbers, residentially selected for social homogeneity, organized on an age-graded basis, and exposed to each other in a variety of social contexts for an extended period. The atmosphere in which a teenager lives is charged with encouragement of marriage, from parents, from the peer group, and from the mass media. From childhood, people learn that marriage is the expected state for adults, and society registers agreement through differential taxation and other policies.

A second contributing circumstance derives from changes in the American culture. Not so long ago, this society consisted of diverse subcultures, each maintaining more or less closed marriage subsystems. But with the increase in geographic and social mobility, and the declining relevance of parental characteristics and influence in the choice of a partner, the size of the marriage market has been effectively enlarged by a relaxation of former restrictive mechanisms. The consequence is to improve the probability of marriage for the average individual.

Superimposed on the moderate trend downward in the age at entry into motherhood was a strong fluctuation. For the cohort of 1914 (which was aged 20 in 1934), the mean age at first birth was 1.0 year above the trend; for the cohort of 1939 (which was aged 20 in 1959) the age was 0.7 years below the trend. This was the principal force underlying changes in the time pattern of cohort fertility, changes that distorted movements in the quantity of period fertility, that is, in the total fertility rate.

There may be a simple explanation for that fluctuation. Over the available time series, there is a very strong correlation between changes in the mean age at first birth in one direction and changes in the size of the cohort in the opposite direction; turning points and magnitudes of change are both in close correspondence. A plausible hypothesis that would make this correspondence more causal than coincidental is that entry into parenthood is conditioned by the relative ease or difficulty with which the entrant into the labor force can become established in an occupational niche and acquire the requisite domestic security and capital. That ease or difficulty in turn depends substantially on the supply of labor, that is, the size of the cohort relative to preceding cohorts. The marginal status of young adults in the labor force makes them peculiarly sensitive to the arithmetic of the market. Another dimension of influence may also be involved; members of a small cohort have fewer siblings with whom to compete for parental assistance in becoming established.

If the foregoing is a sound argument, it provides a valuable tool for forecasting, because one can readily estimate the numbers of young adults several decades hence from the numbers being born currently. The decline of cohort size from the 1960s to the 1970s would imply a decline in the age of entry into motherhood from the 1980s to the 1990s, as the smaller cohorts experience more-favorable job markets and therefore can start families earlier. All this would produce an upward distortion in the quantity of period fertility.

But enthusiasm for the idea needs to be qualified. In the first place, the low supply of labor associated with cohort size in the 1950s was coincident with a high demand for labor brought about by vigorous economic growth; the high supply of labor in the 1970s coincided with sluggish economic growth. In the second place, the

hypothesis that age at entry into motherhood is inversely related to the employment prospects of young men implicitly assumes a traditional division of labor by gender. Females are regarded as only casually involved in the labor market because their primary responsibilities are domestic; the model is reinforced by substantial job discrimination by gender, which keeps the alternative-opportunity cost of motherhood low. If the respectability of roles for women other than those of housewife and mother increased, if the relative level of education for women increased, and if discrimination diminished somewhat, a smaller cohort size in the coming decades might facilitate the participation of more females in the labor force, as well as males, and work against earlier motherhood. In the third place, the cohort size theory addresses fluctuations about the trend in mean age at first birth rather than the trend itself. Notwithstanding the fact that the long-term trend in the mean age was downward despite a continuing rise in school-leaving age, it is plausible that still further increases in women's education, beyond high school, would reverse the trend. Eventually the conflict between schooling and motherhood would press upward the age of motherhood.

Quantity of Cohort Fertility. The next subject for consideration is determinants of the quantity of cohort fertility. For this purpose it is useful to distinguish between the process of small-family formation (the first two children) and the enlargement of family size beyond the second child. The theoretical basis for this distinction is the contrast between what may be called "normative" and "discretionary" childbearing. Throughout the era under discussion, the prevalent norms impressed upon new members of the society by socialization and social control have supported the propriety of marriage rather than nonmarriage, parenthood rather than nonparenthood, and two children rather than an only child, provided the couple has the wherewithal to fulfill their responsibilities as parents. The decision to have births of higher order than the second has, to the contrary, been regarded as a matter of personal choice.

The empirical justification for this distinction is evident in the following tabulation. The total fertility rate (G) for a cohort may be expressed algebraically in terms of the proportion of women having at least two children, $P(2+)$, and the average number of children born to those women, $M(2+)$, with a residual factor to complete the equation stated as $P(1)$, the proportion of women having only one child. Then

$$G = [P(2+) \times M(2+)] + P(1).$$

The residual factor is minor in significance and will not be discussed further.

Because the cohort total fertility rate, G, declined monotonically from cohort 1867 to cohort 1908, rose monotonically from cohort 1908 to cohort 1933, and has declined monotonically since then, the time series shown in the following tabulation is focused on the values of the components at these turning points.

Cohort	G	= $P(2+)$	× $M(2+)$	+ $P(1)$
1867	4.07	0.705	5.634	0.10
(% change)	(−44)	(−21)	(−35)	
1908	2.27	0.556	3.674	0.23
(% change)	(+42)	(+47)	(+4)	
1933	3.22	0.819	3.815	0.10
(% change)	(−40)	(−22)	(−29)	
1950	1.92	0.639	2.712	0.19

In the two episodes of decline, both the index of normative fertility, $P(2+)$, and the index of discretionary fertility, $M(2+)$, played important roles, although the change in the latter was appreciably greater than the change in the former. In the episode of rising fertility, on the contrary, the dominant factor by far was the increase in the proportion having at least two children, $P(2+)$. Thus a clear explanation of the baby boom is essentially a question of the rise in $P(2+)$.

That proportion is the product of the probability of having at least one child (which rose from 78.2 to 91.8 percent) and the probability, for those who are fertile, of having at least one more child (which rose from 70.6 to 89.6 percent). The remarkably high values for the birth cohort of 1933, at the peak of the baby boom, must have been close to the physiological maxima, implying almost no voluntary renunciation of motherhood.

Why did the proportion of women having at least two children rise so much from cohort 1908 to cohort 1933? One thesis is that a small contributing factor to the rise may have been a decrease in involuntary infertility; that would be the expected consequence of a younger age distribution for potential mothers, and of improved medical care, especially with respect to venereal disease. Another thesis, probably the most popular, is that parenthood is governed by fashion; it was out of style at the time of the trough but in style at the time of the peak. Yet it seems incredible that any behavior pattern of paramount importance to the survival of a society would be left so much to individual caprice. A more elegant version of the same argument is that there must have been a change of values making family life more important. Hypotheses such as these are scientifically invalid because they are irrefutable; the evidence for the explanatory variable is the behavior it is invoked to explain.

A plausible and testable alternative thesis focuses on the proviso attached to normative fertility that people should not have children unless they can afford them. With the substantial rise in income from the 1930s to the 1950s, the reproductive franchise was in effect extended to almost the entire population. Certainly circumstances after World War II were especially propitious for having

a family. Economic growth stimulated the demand for labor while smaller cohort size restricted the supply of labor. Governmental intervention transferred resources from nonparents to parents, and from the more-advantaged to the less-advantaged, especially by raising the income floor.

Any argument that, like this one, asserts a positive relationship between fertility and income would seem to fly in the face of a substantial body of apparently contradictory evidence. Time series for individual countries, comparisons between countries, and differentials for individuals within countries all provide ample documentation of an inverse relationship between fertility and income. Yet that evidence may not be germane. Such data confound normative and discretionary childbearing and intended and unintended births. Moreover, the hypothesis is not that higher income implies higher fertility for a couple, but rather that the proportion of couples with income sufficient to meet the prevailing standards of parental obligation increased substantially between the 1930s and the 1950s.

A supportive role may also have been played by the changes in the time pattern of fertility, discussed earlier. Whenever economic conditions provoke a substantial delay of entry into parenthood, the alternative-opportunity cost of childbearing rises, to the extent that some who had been postponing motherhood decide to remain permanently infertile. On psychological, medical, and other grounds, women may have a clear sense of how old is too old to have a baby or raise a child. On comparable grounds, a later age at first birth may lead to termination of fertility with that one child. In brief, the circumstances that promote later childbearing may also promote a smaller proportion with at least two children. The converse argument is applicable with respect to the earlier childbearing that was characteristic of the 1950s.

As noted earlier, the composition of the rise in cohort fertility was a 47 percent increase in the proportion having at least two children, and a 4 percent increase in their mean number of children. Although the latter change is evidently of much less arithmetical significance than the former, it deserves an explanation because the tiny rise signals the interruption of a long and strong downward trend in what was called "discretionary fertility." (The precise temporal scope of the rise in $M(2+)$ was from 3.54 for cohort 1915 to 3.84 for cohort 1931.) Corresponding approximately in time to these birth cohorts are the marriage cohorts of 1935–1939 and 1950–1954, for which we have detailed observations of experience with fertility regulation, from the 1965 and 1970 National Fertility Studies. Over that time span, for experience cumulated to a marital duration of fifteen to twenty years, intended fertility rose only negligibly from 2.60 to 2.66 children per woman, whereas unintended fertility

rose from 0.34 to 0.64. Corroborating the role of unintended fertility in explaining the small rise are other features; fertility beyond a marital duration of fifteen to twenty years would likely be heavily unintended, some of the increase in intended fertility consisted of first and second births, and there is reason to believe that some births that were in fact unintended were misreported as intended. In sum, most and perhaps all of the reversal of the downward trend in $M(2+)$ consisted of unintended fertility. "Discretionary fertility" evidently includes a substantial and variable "indiscreet" component.

One reason for an increase in unintended births during the course of the baby boom was earlier formation of families, which left more years of exposure to risk. The mean age at which women had their second birth declined from 27.3 for cohort 1915 to 24.9 for cohort 1931, which prolonged the subsequent task of prevention. But that was not the whole story, nor even the most important part of it. Again from the National Fertility Studies it is known that the rate of unintended fertility per person-year of exposure to risk increased by more than 70 percent during the time. This is a surprising finding because one would expect improvement in the practice of fertility regulation to be a concomitant of increased education, urbanization, secularization, and the like.

A plausible explanation for the deterioration in the ability to prevent unintended fertility is the following. Prior to the introduction of modern contraceptives in the 1960s, successful fertility regulation called for strong motivation because all of the available methods were coitus-related. The decline in efficacy from the 1930s to the 1950s can be ascribed to a weakening of motivation among those intending to terminate their childbearing. In an era of relatively low income, motivation is spurred by the force of necessity, whereas when income is relatively high, there is less apprehension that an unintended birth would reduce the family fortunes below an acceptable scale of living. Women who become mothers at younger ages have had less opportunity for prior non-domestic experience. That may diminish their interest in such experience subsequently, relative to continued childbearing.

Since the early 1960s, the situation has changed in every particular. The discretionary component of fertility, $M(2+)$, has resumed its decline, and at a more rapid pace than ever before. The mean age at second birth has risen, from 24.2 for cohort 1938 to 25.8 for cohort 1950, easing the task of regulating future fertility. The rate of unintended births per person-year of exposure has dropped dramatically. The motivation to prevent unintended births may be surmised to have increased with the cessation, at least for the time being, in the growth of per capita income in real terms, and with the increasing tendency for women to participate in the labor force

prior to starting families. And modern contraceptives, such as sterilization, the intrauterine device (IUD), and the pill, have reduced the level of motivation required for a given level of efficacy because they are all independent of coitus.

The Future Course. Let us consider the most likely future course (over the next several decades) in light of the three parameters of cohort fertility to which attention has already been directed: the mean age at first birth; the proportion having at least two children, $P(2+)$; their mean number of children, $M(2+)$. The strategy is to consider the probable trend in each parameter, based on the causal nexus underlying long-term change and the extent to which short-term modifications are anticipated in light of what has been learned about the fluctuations in all three.

1. The parameter that would seem to lend itself to the most confident prediction is the mean number of births for those with at least two children. This number, $M(2+)$, declined from 5.6 for cohort 1867 to 2.7 for cohort 1950. Moreover, it is clear from the estimated level of total fertility at the beginning of the nineteenth century that the value of $M(2+)$ had then been no less than 8 and perhaps as high as 10. The moderate recent reversal has been explained as an increase in unintended births associated with a rise in economic growth in a period before modern contraceptives were available. If, as seems to be the consensus of economic opinion, growth in the next several decades will be at best sluggish, a subsequent rise in $M(2+)$ seems quite unlikely (barring legal changes governing the means of fertility regulation, especially abortion).

The expectation of continued decline in $M(2+)$ is more than mere extrapolation. Its historic decline is ordinarily explained by one or another variant of the consequences of modernization for the family. Industrialism is essentially a system for enhancing productivity by introducing the division of labor into all societal activities. Units with specific tasks are highly differentiated. Human resources are exploited on a rational basis in terms of individual merit. A specialized and efficient labor market requires technical education and individual mobility. The consequence for the family is that it is progressively stripped of its former responsibilities as the source of technical education, the avenue of employment, the channel of credit and social security, and the source of protection. As the direction of obligation of the intergenerational contract shifts from what the child owes the parent to what the parent owes the child, the argument against having more than a small number of children is progressively strengthened. Nothing in the foreseeable future would seem likely to change this trend.

2. With respect to the proportion having at least two children, there is little evidence for any long-term

change, though the picture is somewhat mixed. A straight line fitted to the available series shows a small positive slope, although the value of $P(2+)$ for the most recent cohort (1950) is 10 percent lower than the value for cohort 1867 and 22 percent lower than the value for cohort 1933. The key question for the future of this parameter is the extent to which the recent decline is a temporary aberration associated with the slowing pace of economic growth or a manifestation of a new orientation to the family.

As specialization stripped the family of its previous functions, the family itself acquired a specialized task, the development and maintenance of the individual self. In a modern society, the individual has greater need for emotional support, and the family is more exclusively the source of that support, serving as an emotional haven for the individual returning from exposure to the frequently damaging consequences of participation in the impersonal, competitive, modern economy. While the purport of this argument is that the family will persist, one cannot be confident that its structure requires two children or one, or perhaps merely the conjugal pair.

One other consideration may be of great relevance for the future of the family. Although women have always been more directly exposed to the costs of children than men, their voice in the reproductive decision reflected their inferior economic and social status. Alternatives to motherhood were not only unrespectable but also, because of educational and occupational discrimination by gender, unrewarding. This situation is now changing. Women are gaining more nearly equal access to the range of educational and occupational opportunities and legitimacy in their pursuit of callings other than motherhood. Although ways can be developed to make domestic and nondomestic activities less competitive with each other, the more likely outcome is to depress the proportion having at least two children, or at least to delay the start of motherhood. In the short term, both of these tendencies seem likely to be reinforced by the consequences for the labor market of the pending decline in cohort size.

If the proportion of women having at least two children is as likely to decline in the future (for the reasons just indicated) as it is to rise (because the current value is only temporarily low), and if the mean number of children born to those women is likely to decline, the consequence is that the cohort total fertility rate will decline from its current value (for cohort 1950) of 1.92. But that value is already 10 percent below replacement level. (With current and prospective survival conditions, a total fertility rate of 2.1 is required to prevent an ultimate negative rate of natural increase for the population.) It is instructive in this connection to consider the theory of the demographic transition. The typical formulation of that theory traces an evolution from an equilibrium state in

which high fertility matches high mortality to a new equilibrium state in which low fertility matches low mortality. The process of equilibration for the initial state is clear; fertility is essentially fixed, and declines in mortality produce population growth, which again leads to rises in mortality. For the final state, mortality is essentially fixed, but there is no mechanism by which declines in fertility, producing population decline, would lead to an equilibrating rise in fertility. The United States, like other modernized countries, may now be in this position.

3. Consideration of the future course of the third component of cohort fertility, the mean age at first birth, is necessary because of the implications of changes in that parameter for the period total fertility rate and the crude birth rate, the indexes directly relevant to analysis of the consequences of population change. It is likely in the next twenty years, as in the past sixty years, that changes in these indexes will depend less on the quantity than on the time pattern of cohort childbearing. Persistence of the strong tendency for small cohorts to have the first birth early would mean a downward shift in the pattern of cohort fertility. But to the extent that the correlation is conditional on traditional roles for women and a supportive atmosphere of economic growth, the relationship will be attenuated. Moreover, the relationship concerns fluctuations about the trend in age at entry into motherhood. Although that trend has been downward during this century, continued rises in the length of education and in labor force participation for women may reverse that trend.

As of the late 1970s, the period total fertility rate is some 8 percent below the counterpart cohort rate. By the end of the century, the net effect of counteracting forces on the time pattern of cohort childbearing should make the period index only a little higher than its cohort counterpart. Since the quantity of cohort fertility is expected to decline, the prospect is that whatever rise may occur in the period, total fertility rate will be small. To complete the sequence, there is one unequivocal effect of the prospective decline in cohort size, namely, reduction of the crude birth rate relative to the period total fertility rate. The clear prognosis is that the birth rate by the end of the century will be substantially lower than in the late 1970s and accordingly lower than at any time in American history.

Conclusion. As with most analyses, the preceding account should be faulted for an excess of tidiness, in light of the substantial ignorance at crucial junctures. It is now clear, from demographic considerations, that determinants of the time pattern of cohort childbearing deserve at least as much attention as determinants of its quantity, and yet our research investment to date has almost exclusively emphasized quantity. The justification for that emphasis—the important role played by unintended births—has been steadily depreciated by improvements in fertility regulation. As exogenous shocks, negative and positive, impinge on the demographic system as they have in the past, we may anticipate, as a by-product of precision in the regulation of births, even more variation from cohort to cohort in the time pattern of fertility but rather less in its quantity.

Yet the coincidence of the time span of sophisticated measurements with a massive fertility fluctuation has probably warped our speculations toward the sources of deviation from the trend and away from determinants of long-run change. In that neglected assignment, it is not obvious that the quantity of fertility should occupy the center of the stage. We may be observing a final phase in the centuries-long evolution of a modern society, in which the family form completes its accommodation to the needs of an industrial economy and women are admitted to full and equal membership. One manifestation of that transformation, the extent of temporal commitment to motherhood, may be the best place to begin an analysis of American fertility.

Norman B. Ryder

See also AGE AT MARRIAGE; CONTRACEPTIVE USE, *article on* UNITED STATES OVERVIEW; FERTILITY DETERMINANTS; MARRIAGE AND DIVORCE; UNITED STATES.

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FORECASTS

See PROJECTIONS.

G

GENETICS

Population genetics is the study of genetic patterns and change from a standpoint of populations rather than individuals. Only certain genetic variables can be measured in human populations, but these are still numerous and have been traced for many groups with comparisons made both within and between societies. Genetic differences and change can be related to such influences as isolation, interbreeding, differential growth rates, the severity of natural selection, and mutations. To the extent that demographic measurements are required for this work, the human population represents an easy species on which to advance the research. Certain biological variables can be directly measured also; a common illustration is the set of genes that determine A, B, and O blood groups, but many other blood characteristics are also used because they are easily accessible.

Differences in fertility can obviously act over the long term to increase the numerical dominance of certain groups in the population. Differences in mortality rates can also do so, except that death rates after the age of reproduction are irrelevant, having no effect upon future generations. Much work on differential growth rates is not specifically linked to particular genetic variables; rather it rests upon the identification of demographic subgroups and clarifies only the possibility of change in genetic composition through differential growth.

The role of natural selection in the human population has been drastically reduced by the mortality revolution. For developed countries and to a great extent for developing ones, the overall rates of mortality have fallen so much, and subgroups within the societies have become so much more uniform in these low death rates, that differential mortality operates far less than before; hence there is much less selection. For example, in the United States only two-thirds of white females born in 1840 reached age 15 and only about half reached age 45. But of females born in 1960, more than 95 percent were expected to reach age 45. Such drastic change increases the "genetic load" as individuals are retained in the population to reproduce who would formerly have succumbed from various genetic weaknesses.

As birth rates to older women decline, however, congenital anomalies also decline. The greatly increased numbers of induced abortions in many countries may also be somewhat selective against births to especially young and especially old mothers. The role of physiological sterility is uncertain; probably it has declined for the most part with general health improvements and to that extent acts to reduce selection.

Certain other trends do not act consistently in any single direction through time and so may have variable consequences from one historic period to another (Kirk, 1968). When a high proportion of people marry and have children, the opportunity for selection is less than if smaller proportions do so. To the extent that couples have a uniform number of children, for example, one or

two, or two or three, there is less variance within the population and hence less opportunity for natural selection through differential family size. If couples are similar in the spacing of their children, the length between generations has less variance, again making for similarity among subgroups. Finally, differential fertility among socioeconomic, ethnic, religious, or racial groups may either increase or decrease within a society; to the extent that it decreases, the composition of future generations will be similar to that of the present. In short, insofar as drastically reduced mortality rates together with homogeneity in both mortality and childbearing patterns appear, each future generation approaches a genetic carbon copy of the previous one.

The mutational factor is of course a separate consideration; increased radiation and chemical hazards may produce more sterility and mutation, particularly in subgroups selected by occupation or residence.

A very different topic within the field of population genetics is the effects of long-term isolation. A population without contact with any other group will by random processes take its own genetic direction. This "random genetic drift" has been studied through mathematical models that rely upon such demographic information as immigration rates and age distributions. Also investigated are the effects of interbreeding, that is, the results of marriages between consanguinous individuals, such as first cousins. This topic is closely related to family structure and customs controlling marriage patterns.

Genetic studies are highly quantitative and rely increasingly upon special techniques. The use of electrophoresis, for example, has considerably advanced the field. It was first employed by Linus Pauling and associates in 1949 to clarify the molecular basis of sickle-cell anemia, an inherited disease that appears with special frequency among African blacks. The technique precisely indicates whether certain measurable differences between individuals have a genetic origin. It has shown the genetically produced biochemical differences between individuals to be remarkably diverse, far more so than the differences among racial groups.

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GLOBAL POPULATION

See WORLD POPULATION.

GOVERNMENT POLICY

Governments adopt many policies that may alter the size, distribution, and growth of population, through relation to the variables of fertility, mortality, or migration. Policies may be designed to have a specific demographic impact, or they may not be so intended while in fact having such effect. The term "population policy" is often popularly understood to mean governmental efforts to reduce fertility rates, through, for example, the contraceptive services provided by family planning programs. Actually the population policy of a particular government at a given point in time usually encompasses a set of policies, laws, and other actions aimed at a variety of specific demographic effects.

General discussion of the subject can be found in the overview article on POPULATION POLICY. The policies of specific governments are described in country and regional articles; for discussion of those of the United States, see POPULATION POLICY, article on UNITED STATES. Policies concerning fertility regulation are reviewed in LAW AND FERTILITY REGULATION; laws regulating family formation and divorce in the United States are discussed in FAMILY LAW. AGE AT MARRIAGE in part describes relevant policies and laws in effect in various countries and regions. Policies relating to international migration and to internal migration and spatial distribution are dealt with in DISTRIBUTION, article on DISTRIBUTION POLICY; in IMMIGRATION POLICY, which deals with the United States; and in REFUGEES, where among other things the international classifications and definitions of refugee status are given.

Action programs developed in part to reduce fertility are discussed in FAMILY PLANNING PROGRAMS, while those organized for the purpose of reducing mortality are discussed in PUBLIC HEALTH.

GROWTH, POPULATION

See FERTILITY AND POPULATION GROWTH; MOMENTUM; PROJECTIONS; WORLD POPULATION.

H

HEALTH

See MORBIDITY; MORBIDITY AND LONGEVITY; PUBLIC HEALTH.

HISTORICAL DEMOGRAPHY

Historical demography can be defined as the application of current methods of analysis to records assembled in the past often for nondemographic purposes, or at least for purposes that were different from those of present-day demographers. Interest in the history of populations is as old as the study of history itself. Historical demography, however, a specialization within demography, has its origins in the twentieth century. Like statistics, it is a discipline of methodology. This brief introduction to the discipline defines its scope, traces its development, outlines its materials and methods of analysis, and concludes with a discussion of major contributions.

Scope. There is an important distinction between demographic history (a branch of history) and historical demography. It is a distinction between substance and methodology. While demographic history seeks to provide an accurate accounting of population change in the past, historical demography is more precisely defined by its data sources and the way they are used to investigate the past.

Demographic history provides a basis for explaining the past from the perspective of population change. Knowledge of the unfolding of population dynamics through time contributes immeasurably to our understanding of events and developments in social and political history. For example, total population size has affected the balance of power among nations. In addition, the relative size of social classes within nations has affected the course of political change and in some instances has provided an underlying cause of revolution. Some French historians have adopted the view that an important factor aggravating the social crises in the final days of the Ancien Régime was population growth during the second half of the eighteenth century, caused primarily by a decline in the French infant mortality rate. In a similar way, the dramatic increase in the mortality that resulted when plague periodically swept through Europe from 1350 to 1650 can be seen to have influenced the social and political history of the period.

To be sure, "demographic facts" are also the goal of historical demography. The discipline, however, is more finely focused upon the kinds of data that can be used to investigate the past. Often data that were not collected for demographic purposes at all, such as the parish registers kept for religious reasons, become the object of historical demography. As another example, original census lists that were treated in aggregate, anonymous ways at the time they were created become for modern-day scholars the means for nominal and individual analyses. It is the methods of research used to elucidate the levels and trends of population in the past that are the domain of historical demography.

Historical Development. Historical demography has its own history. The discipline was formalized during the post–World War II period in Europe, primarily in France and England. Without doubt, European scholars led the way in scope of analysis and development of methodology. Only in the last fifteen years has vigorous interest in historical demography emerged in the United States and other parts of the world.

The French originators of historical demography were interested in investigating certain types of demographic situations that were not easily accessible in the data of the present day, such as high fertility in the absence of contraception. Michel Fleury and Louis Henry (1965) turned to parish records and developed the method of family reconstitution. This method consists of linking names and demographic events found in parish registers to rebuild the history of families. The main virtue of the method is that it permits scholars to examine marital fertility in the past, at a time when it can be presumed that little, if any, contraception was used. Louis Henry (1956) promoted the concept of "natural fertility"; natural, or uncontrolled, fertility can be recognized when the records indicate that groups of couples with different ages at marriage and different numbers of children had similar age-specific fertility rates. This notion of a quasi-biological level of fertility initiated a series of village monographs.

Studies of natural fertility can be repeated in any village with good records before the onset of fertility control. The raw material is abundantly available in Europe because Christian churches have recorded baptisms, marriages, and burials with increasing regularity since the fourteenth century. As a result of the many studies conducted, we have a much greater awareness of the diversity of demographic profiles.

Levels of marital fertility before the fertility decline vary greatly among different areas for reasons that remain to be explained adequately. One current explanation cites differences in breastfeeding customs, which may account for variable lengths of amenorrhea after birth. However, the influence of diet, environment, and health on fecundity, or of customs, taboos, and behavior in the area of cohabitation and intercourse, may explain the differentials more adequately.

Additional studies have challenged the very concept of natural fertility, arguing instead for the pervasiveness of contraceptive behavior. E. A. Wrigley (1966) in his study of Colyton, a parish of Surrey in England, believed he had identified clear evidence of contraceptive behavior in the middle of the seventeenth century. Although these results have been questioned and debated, Colyton has been cited more often than any other study in historical demography.

From the period of village monographs, scholars have recently moved on to studies of large cities or regions and to samples of entire countries. Perhaps the most ambitious project is the Historical Demography Research Project at the University of Montreal, which is attempting to reconstitute the French Canadian population in its entirety from its beginning in the seventeenth century. Most recently computers have been employed in family reconstitution to provide automatic nominal data linkage.

In the United States interest in historical demography developed from a convergence of interests from several disciplines. Historians desired a more quantitative basis for analysis and knowledge of everyday life during the colonial period. Sociologists wanted to examine the evolution of American social structure and the changing nature of the family as a social institution. Demographers wanted to explore the possibilities of applying the new methods of historical demography to American data to determine whether preconceptions about fertility and mortality during the colonial period could in fact be substantiated.

Most of the American research has focused on seventeenth- and eighteenth-century New England communities. The purpose has been to provide information on marriage, fertility, and mortality patterns. To this end, American parish records have been analyzed using the Henry-Fleury method. The records appear to be usable, although more subject to underregistration and interdenominational mobility than those in continental Europe.

In general, American scholars have relied more on the use of census manuscripts than have their European counterparts. The European countries were concerned with counting their colonial populations. One result is that data from 124 censuses taken in the British colonies of North America and the West Indies have survived in part. These manuscript censuses have provided the underpinnings for the study of household and family structure, mobility, race relations, and occupational structure. In contrast to studies based on parish records, these studies have emphasized the urban environment and patterns of migration.

Sources of Data. Much of the literature in historical demography is devoted to discussion of data sources. There are descriptions of sources in general (Hollingworth, 1969) and of sources for particular regions, such as the United States (Cassedy, 1969). Most of the sources used in historical demography are written, although estimates of population size are sometimes derived from archeological excavations or from evidence of land use. In the subfield of paleodemography, age distributions of skeletons continue to be scrutinized for information on mortality. [*See* PALEODEMOGRAPHY.]

The written sources fall into two categories: (1) the

primary sources themselves, for example, lists of names and certificates, and (2) secondary compilations made at some later stage, usually close to the time of data collection. Primary documents have been the preferred source material of historical demography.

The primary sources include such nominal lists of people as the following: population registers; yearly village population records, such as the Japanese Shumon-aratame-cho (Hanley, 1974); manuscript census lists; lists of taxpayers or taxation records for an entire population; and *status animarum* or catechetical lists such as those of parish registers. Additional nominal records, which have been used somewhat less frequently, include contracts and tombstones.

Even when original manuscript lists and vital records have been destroyed, or lost, or are otherwise inaccessible, there is considerable secondary material for extended periods of the past. Much can be done to evaluate, analyze, and correct the secondary material, even without access to the raw material.

Genealogies are an additional type of secondary source, which have been important in demographic research on closed social groups. Although they provide no information of the true size of the population they might be assumed to represent, they provide good indications of the demographic rates prevailing at that time and of changes in those levels.

Several strategies have been adopted to investigate the quality of data. For example, underregistration may be detected by using model life tables to test the internal consistency of demographic parameters. In particular, infant mortality rates are often examined because they are sensitive to underregistration of both births and deaths. A drawback to this method is that the available tables rest on fairly restricted and culturally homogeneous data sets. Recent work in some developing countries suggests the existence of very different mortality schedules from those found in the standard tabulations. It is not unlikely, for example, that the nature of epidemic diseases prevalent in earlier historical periods produced age-specific mortality schedules different from those of the late nineteenth and early twentieth centuries.

One method of evaluating data for indication of unrecorded births involves calculating the sex ratio at birth, which is generally considered to be a physiological constant over time and space. For most populations it is safe to assume a ratio of 105–106 males per 100 females. If there is a very marked deviation from this, there is reason to suspect differential completeness by sex in the recording of births.

Another method of evaluating data analyzes birth intervals from pregnancy histories. The interval between successive births in societies not practicing birth control normally varies between eighteen and thirty-six months.

Because breastfeeding prolongs postpartum infecundity, birth intervals in breastfeeding populations tend to be shortened when the infant whose birth started the interval dies within its first year of life. Thus short birth intervals may indicate the extent of birth and infant mortality omission. Conversely, the recorded interval will be longer if some births are unrecorded or if birth spacing is being practiced. It has been shown that for most populations if average birth intervals exceed thirty-four months it is likely that either births have been unrecorded or births were being spaced.

Methods of Data Treatment and Topics of Analysis. A fundamental distinction is made between aggregative, or anonymous, treatment of data and nominal linkage. The former cumulates data by months and years from the vital records on births, marriages, and deaths in a particular community. This permits the demographer to chart relatively rapidly the course of population growth and decline in each community, and hence patterns of population growth over a number of communities. Of prime importance, however, is the availability of a complete and reliable series of vital data.

Nominal linkage, or family reconstitution, differs from aggregative analysis in that it attempts to trace the vital events within particular families rather than the general patterns of population growth in the community as a whole. Marriage records are matched to records of births and deaths of children to recreate the history of each union. A completely reconstituted family is one in which the dates of birth and death for the marriage partners, and date of marriage dissolution, are known, as well as birth dates for each of the offspring of that union. In order to study marital fertility it is also essential to know the age of the mother at the birth of every child.

Because of geographic mobility it is usually possible to reconstitute only a small portion of the families in village studies. In addition, reconstituted families have to be further divided by chronological period, age at marriage, and so on. As a result, study conclusions may be based on a small number of possibly unrepresentative cases. Two inherent problems of nominal linkage, the sheer magnitude of the job and the difficulty of realizing linkage on a scale sufficient to achieve representative results, have stimulated the search for new methods using nonnominal sources.

In historical demography, the type of data treatment largely determines the topics of analysis. For example, when family reconstitution by nominal linkage is undertaken, analysis will usually concentrate on marital fertility and child mortality, rather than overall fertility or mortality.

As a result of the peculiarities of the raw material, new indices and original methods of analysis have emerged. The longitudinal nature of linked data has stimulated

construction of cohort life tables and analysis of birth intervals, neither of which had attracted much interest previously. Such indexes as the age of the mother at birth of last child have become standard tools for examining fertility control. Similarly, the re-creation of long series of vital statistics or census results has led to new approaches, such as population reconstruction. More recent research, while continuing to utilize the traditional historical sources, has focused on new subjects and new methods. Among these are the study of family structure, social structure and mobility, and the development of urban history.

Major Contributions. Research in historical demography has expanded tremendously since the mid-1960s. The formalization of the discipline has exposed scholars to new forms of data and methods of analysis, resulting in major contributions to our knowledge of the social, economic, and demographic characteristics of populations in the premodern statistical era. Beyond the development of a distinct methodology, an important theme underlying much of the postwar research has been the clarification of the theory of the demographic transition. Perhaps one of the most important conclusions of the work on historical determinants of fertility is that married couples in many rural areas of preindustrial Europe deliberately limited the number of their children well in advance of the demographic transition. The evidence points to marked differences in levels of marital fertility among regions, social classes, and time periods, suggesting the selective presence of fertility control within marriage.

Research from preindustrial American sources indicates that marital fertility was higher than that prevalent in western Europe at the same time. The evidence from local area studies in America is that average completed family size in the eighteenth century ranged between five and seven children. A variety of factors have been suggested to explain this phenomenon, including the low age at marriage for women, possible improved expectation of life over European conditions and favorable economic opportunities. However, analysis of pregnancy histories from a group of Quaker families reveals the initiation of family limitation prior to the American Revolution and almost fifty years ahead of the general decline in fertility documented from 1810 onward. Although the research indicates that it has been possible to isolate instances of preindustrial populations deliberately limiting their fertility, the precise mechanism and predisposing factors remain elusive.

With respect to nuptiality patterns, research indicates that western Europe was unique. J. Hajnal (1965) was the first to observe that west of the straight line running from Trieste to St. Petersburg (now Leningrad) the age of marriage was high until recent times, and many women and men never married. The most important demographic consequence of the "European marriage pattern" was a marked lowering of fertility.

Until recently, the demographic transition from high to low fertility and mortality seemed to be chiefly a European, North American, and Japanese phenomenon. In most of the countries of Asia, Latin America, and Africa only mortality had declined. Because fertility remained at high levels, the developing countries seemed more like Japan and the countries of Europe and North America two hundred years ago than like those countries today. Thus understanding the historical conditions and processes that existed before the demographic transition and during the early stages of the decline of fertility in Europe, Japan, and North America could contribute to solving the enormous problem of reducing birth rates in the less-developed countries. However, the demographic history of other areas, such as South America, may be more relevant than a similar study of the demography history of western Europe. In recent years there have been efforts to use parish records of developing countries, notably in the Philippines and in Latin America, to reconstruct their demographic past.

To conclude, historical demography as it has evolved in its first thirty years is not simply a marginal part of demography. As a science, it is still in its formative and expansive period of development. Each new analysis narrows the uncertainties of previous studies but raises new problems of its own.

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See also FERTILITY DECLINE, *article on* EUROPEAN TRANSITION; PALEODEMOGRAPHY.

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HOUSEHOLD AND FAMILY DEMOGRAPHY

Demographers are interested in the size and composition of households and families, their variations in size and structure among nations and among subgroups within nations, and their variation over time, both historical changes and changes over the individual or family life cycle. The demographic determinants (age structure and the processes of fertility, mortality, marriage, divorce, and migration) of change and variation and socioeconomic determinants (such as income or wealth, occupation, culture, and urban-rural residence) are additional concerns in this field. Socioeconomic consequences studied by demographers include patterns of child care, age-sex roles, intergenerational relations, problems of isolation and dependency among the elderly, and household income patterns.

Increasing availability of data sets and computational equipment that allow for the relatively easy identifica-tion and description of distinct households has encouraged work on household structure. These microdata take several forms: public-use tapes from contemporary population censuses or national sample surveys; census manuscripts from older censuses which are no longer confidential; and such other nominal lists as church or government records. The use of the latter for various demographic purposes, including family and household studies, has been facilitated by the development of elaborate methods of family reconstitution.

Demographic theory increasingly focuses on the household as a key decision-making unit in demographic behavior and thus as a key unit of analysis in empirical studies. Work on the microeconomics of fertility represents the strongest thrust in this direction, but there is a large psychological literature.

The approach based on the household as a decision-making unit has been applied also to other demographic behavior such as family planning and abortion, marriage, migration and moving, and the decision to leave the parental home. All of this work has tended to shift demographic focus from an older almost exclusive theoretical emphasis on national populations and other large population aggregates down to the level of the household, the couple, or the individual. Similarly, sequential decision-making models have given renewed theoretical relevance to traditional descriptive demographic work on the family life cycle.

Basic Concepts. Both in everyday language and in social science, the words "household" and "family" have a variety of meanings.

In common usage and in much social science literature, "family" refers quite generally to a group of kin, that is, persons related by blood, marriage, or adoption. But it is sometimes narrowed to refer to the group of kin with whom one resides and sometimes broadened to include a larger circle of kin regardless of residence.

Demographic usage has been dictated partly by everyday language and partly by the methodology of modern population censuses and surveys, which use the household or dwelling unit as the unit of enumeration. The unit of census enumeration is central to the system of definitions. "Family" refers only to those kin with whom one resides in the same dwelling unit. Persons living in the same dwelling unit comprise a "household," whether they are all related or not. Kin with whom one does not share the same dwelling unit are not part of one's "family" in the demographic sense, even though they may live close by (sometimes in adjacent dwellings) and even though there may be considerable interaction with them. Standard census procedure does not allow otherwise. This restriction applies as well to the phrase "extended family," referring to a group of kin beyond the nucleus of

husband, wife, and their children. In census practice, the term "extended family" can refer only to a group of kin living in the same dwelling.

Current practice has been criticized on the grounds that the delimitation of separate households by blocks of data in nominal lists often is questionable or arbitrary and on the grounds that focus on the household (i.e., the coresident domestic group) to the neglect of a wider circle of kin can be substantively misleading. That the issue is more than just terminological can be seen by contrasting views on the nature of the group within which the majority of children were socialized in premodern societies.

Despite these limitations of traditional census data, their definitions are defended partly because the household is an important group in its own right, partly because data on the household constitute such a large untapped resource. A contrary argument is that household structures and kinship are so intertwined that they must not be separated for analytic purposes and that demographic data must be supplemented by materials of comparative ethnography.

The establishment of stable conventions regarding the definition and measurement of terms such as "family," "extended family," and "household" and the sorting out of theories and empirical generalizations regarding each of these groups remain central tasks for household and family demography.

Measurement. Families and households can be analyzed in terms of size and structure.

Size. Given unambiguous concepts of "family" and "household," the measurement of size is straightforward. It is necessary only to distinguish private from institutional households, which typically is done in tabulations provided by census agencies or in international compilations such as the United Nations *Demographic Yearbook,* and to eliminate one-person households when computing *family* size from a distribution of households by size. This latter procedure involves some slight error, insofar as not all persons in private households are related persons (as, for example, boarders, servants, and lodgers), but the error is small for most analytic purposes. More nearly exact computations of average family size can be made from data on population by relationship to head of household, that is, by confining oneself to relatives of the head.

A distinction has been made between two closely related measures of average household size, namely, "mean household size," or the unweighted average of the distribution of households by size, and "size of household of the average member of the population," or a weighted average household size using the number of individuals in each size of household category as weights. The latter has been termed "mean experienced household size."

These measures are highly correlated over time and space, however, and the small differences between them have not been shown to be substantively important. Measures combining cross-sectional data on size with time have been suggested to yield measures of person-years of family life lived or person-years of dependency. Such size-related measures are still exploratory.

Structure. The measurement of household and family structure centers around the notion of departures from the form presumed simplest or most basic, namely, the nuclear family of an adult couple and their own children. More complex structures are then seen as resulting from the addition of other kin (parents of the couple, grandchildren, uncles, or any other nonnuclear-family kin) or from the addition of unrelated persons such as servants or boarders. A related notion, a rough obverse of complexity, centers around the extent to which adults other than husband-wife couples tend to maintain separate households as "primary individuals" rather than living with relatives.

Various measures of household and family complexity can be classified into two broad categories based on the type of data they use. The first class makes use of information on the relationships among persons in the household, based on an explicit census or survey item on the relationship of members to the head of the household. The second class of measures, in the absence of a direct question on relationship, uses other, more routine information either as a basis for inference of or as a proxy for relationship data.

To the first class belong measures expressing household or family complexity in the form of ratios showing the frequency of various kinds of relatives or nonrelatives per household or family. Another way of interpreting these measures is to see them as a partitioning of average household or family size into various components—head and spouse, own children, parents and in-laws, grandchildren—depending on the detail with which relationship data have been collected and tabulated. Traditionally, however, census tabulations of relationship data have not been fully cross-tabulated with age, sex, and marital status or with other socioeconomic characteristics of the head or of other household members, which limits their analytic usefulness.

Relationship data are also used in the computation of *headship rates,* the ratio of heads to population or (since there is by definition a one-to-one correspondence between heads and households) the ratio of households to population, where possible computed for specific age, sex, or marital-status categories. Proportions of persons who are heads of household or family are in effect inverse measures of complexity, since the more persons who head their own households, the fewer remain to add to the

complexity of households and families of others. Since minor children virtually never head their own households, headship rates properly are confined to the adult population.

A third use of relationship data is the development of typologies of families and households. Apart from occasional tabulations of households and families by number of generations contained, most typologies are based on the classic distinction made by Frédéric Le Play among nuclear or conjugal, stem, and consanguine or extended families. These typologies differ considerably, however, in basic concepts and in the degree of detail, and there is no commonly agreed upon system for the classification of households. There is some agreement, however, that for many substantive purposes one would want to identify separately at least the following: one-person households; nuclear-family households of husband, wife, and own children; truncated or incomplete nuclear families of one adult and own children, with no spouse or other adult present; households containing more than two generations; households containing two or more married couples, in the same generation (horizontal extension) or in different generations (vertical extension).

In the absence of a census or survey question on relationship to head of household or family, various analysts have used other, more-routine demographic information of the second class either to infer relationships among individuals or to derive proxy measures of relationship and structure. The former approach uses such information as an individual's age, sex, marital status, surname, or fertility, and is represented in its most elaborate form in procedures of family reconstitution from civil or church records. It has also been used successfully with population census manuscripts, where individual households are identified but relationship within the household was not explicitly measured.

Some authors have suggested the use of age, sex, and marital-status data to compute aggregate measures of household structure, such as the ratio of adults per household, or an overall adult headship rate (Parish and Schwartz, 1972). Either of these ratios, however, is analogous to a crude rate, so that some of their variation reflects differing or changing age, sex, or marital-status distributions within the adult population rather than differences or changes in specific rates of headship (Burch, 1980).

Another suggested measure of the second class is the number of marital units per household, where the number of marital units is defined as the number of married males, plus the number of widowed and divorced males and females. The reasoning behind this measure is as follows: if all persons marry and all married couples, represented by number of married males, and all widowed

and divorced persons maintained separate residences, the number of marital units would equal the number of households and their ratio would be one to one. A ratio of marital units greater than one indicates doubling up of marital units and thus household complexity. Where a size distribution of households is available, it has been suggested that the proportion of one-person households (i.e., the proportion of persons living alone) be used as a measure of the weakness of the extended-family household pattern.

Regardless of the class of measures used, the characterization of large populations in terms of average, typical, or dominant household or family structure has been seen as increasingly problematic for a number of reasons. One reason is that there are large changes in household and family structure over the family or individual life cycle, documented in detail by demographers, sociologists, and anthropologists. Thus, at any given time, a cross-sectional measure of household complexity (e.g., nonnuclear relatives per household or percent of extended-family households) may be relatively low even though most families or households achieve a high degree of complexity at some point in their life cycle, or most persons spend some of their early years in a relatively complex coresident group.

Another reason is that some complex family or household form may predominate in the sense that it is a widespread cultural ideal, even though only a minority of households or persons achieve it, just as a society may be characterized as polygynous, even though only a minority of men have more than one wife.

Another reason arises from the looseness with which family types or household systems are often described. E. A. Hammel and Kenneth W. Wachter (1977) give a powerful demonstration of this point with reference to the so-called stem family of traditional European society. They distinguish between two inheritance systems, either of which could be referred to as a "stem family system": one in which the first child to marry remains at home and inherits the farm (which they term "primonuptial") and another in which the last child to marry remains at home and inherits (which they term "ultimonuptial"). The former system favors the simultaneous survival of the younger couple and the parents, and thus favors more complex residential groups. Thus, different forms of a broad family system type (such as stem or extended) may yield very different empirical results.

Trends and Intersocietal Differences. A central theme in recent demographic writing on household and family structure is that of the relative lack of variation in size and structure among societies. Despite popular impressions and scientific evidence on the wide variety of family forms, it is argued that household and family

structures have looked fairly similar in a number of respects in all human societies past and present.

Family sociologists had earlier corrected what was seen as an exaggerated emphasis on the isolation of the nuclear family of developed, mostly Western societies, by documenting patterns of interaction among extended kin. They described contemporary families as "modified extended" rather than simply nuclear, and suggested they were more similar to complex families of the past than had been suggested by earlier writings. The focus, however, was on kinship interaction rather than coresidence. Another view is that family and household systems of the past and those of contemporary developing nations involved or involve less complexity than commonly believed, suggesting that the multigenerational family living under one roof was often more an idealized memory than a common reality.

An even stronger assertion of the relative invariance of family structure came from Marion J. Levy, Jr. (1965, pp. 41–42), who stated that "the general outlines and nature of the actual family structures have been virtually identical in size, age and sex composition, generational composition, number of marital pairs, and number of siblings in all known societies in world history for well over 50 percent of the members of those societies." In speaking of the "family," Levy clearly had in mind the residential group of kin living in the same dwelling, not a broader group of kin living in different residences. He qualified the generalization by excepting what he termed transitional populations, namely, those in which mortality has declined while fertility remains high. Levy's thesis is based on a sharp distinction between ideal and actual patterns of coresidence. He asserted that cultural ideals of large complex residential groups commonly were not attained because of psychological, economic, or demographic constraints. In particular, in premodern societies high mortality prevents their attainment insofar as it reduces the likelihood of the simultaneous survival of kin. Levy's strongly argued views helped guide later empirical analyses of household statistics, which have provided qualified support for the hypothesis of invariance as stated.

Added force was given to the argument for the relative constancy of family structure by Peter Laslett (1972) in his analysis of the history of the English household. He found as late as 1901 no sign of a large, extended, coresidential family group of the traditional peasant world giving way to the small, nuclear, conjugal household of modern industrial society.

Apparently, much of the change came later, as fertility declined to low levels. The United Nations Population Division, for example, showed time series of average household size for twelve more-developed nations, for most of which there is a clear downward trend from averages of roughly 4 to 6 to averages of 2.5 to 4. In general, the data on size and other aspects of family structure compiled by the Population Division suggest change and variation rather than constancy (United Nations, 1973).

Attempts to resolve the issues surrounding this thesis of invariance, or constancy, founder partly because of a lack of relevant empirical data and of sufficient analysis of what exists, partly because of a lack of clear criteria for assessing the size of observed variation; for example, how much is a lot? Clearly this depends on substantive perspective, and most of the discussions mentioned have proceeded more or less descriptively, with the issue of amount of variation floating free from clear theoretical issues that could provide the necessary quantitative standards.

Change over the Family Life Cycle. As noted above, the attempt to characterize a society as to its family or household structure at a point in time is complicated by the fact of substantial change during the lifetime of an individual family or household. Aggregate data at one point in time catch households at different stages of this life cycle and thus may obscure important temporal variation.

The concept of family life cycle is standard in demography and, in the English-speaking world at least, is most closely associated with Paul C. Glick, who pioneered in conceptualizing and measuring family life cycles and in empirical studies of the United States (1977). Comparative studies of the life cycle are rare. Data for the life cycle of the United States contrasted with data for Banaras (Benares), India, show that life cycle stages are much less clearly defined there, and that the long period of childbearing, combined with high mortality, yields a high proportion of orphans and widows with dependent children (Collver, 1963). Analysis of genealogical data for 276 Quaker families in the American colonies in which the wife had been born before 1786 demonstrated the virtual absence of marital life for a couple after their children were grown (Wells, 1971). Given high mortality and a prolonged reproductive period, by the time the children were grown one or both of the spouses was likely to have died.

In the comparative study of household and family structure, strong impetus for the adoption of a life cycle perspective has come from anthropological, historical, and social demographic studies. It was found for Taiwan, for example, that most married couples of reproductive age had lived at one time in extended households, if the husband's parents were alive and in Taiwan when the marriage began, even though in a cross-sectional view of sample data 60 percent of households were nuclear (Freedman et al., 1978).

Differentials within Societies. Detailed census-based studies of differentials in family and household structure among subgroups within populations are not abundant, probably because of the absence of detailed cross-tabulations in traditional census publications. Prevailing generalizations derived from survey data, often of limited comparability, tend to associate large and complex family forms with rural residence and with wealth. There are supporting data, but there are also many exceptions, and the empirical base for precise generalization remains sparse.

Type of head. Households tend to be more complex when their head lacks a spouse (single-parent households) than when they are headed by a husband and wife. This tendency to complexity is more pronounced when the single parent is male. Truncated nuclear families (as they have sometimes been called) thus appear to try to improve their ability to perform normal household and family functions by adding nonnuclear relatives to the residential group. The need for extra help seems to be felt more by male heads of household than by female heads.

Marital status. Being a head of household is closely associated with marital status; the likelihood is highest for married males and their wives, lowest for single adults, and intermediate for widowed and divorced persons. Group differences in marital status, therefore, might be reflected in differences in household complexity. But the associations with marital status as such are modified by culture and by economic and demographic structure, so that the picture is clouded.

The United Nations Population Division presents striking comparative data for Sweden and Japan at recent censuses (United Nations, 1973). For both countries, the differentials in the rate of being head of household (headship rates) among marital-status categories follow the same order, but within specific marital-status categories the rates are consistently lower for Japan than for Sweden. The differences are especially pronounced for older females. To put it differently, unmarried persons in Japan are much more likely to live in someone else's household, with a consequent greater prevalence of complex forms.

Rural-urban residence. Households and residential families typically are larger and more complex in rural areas than in cities; but there are many exceptions, which associate family complexity with urban residence and the greater wealth and power in urban areas. Concepción and Landa-Jocano (1975) present data for several Asian nations, however, showing no consistent relationship between rural or urban residence and percentage of extended families. Two other arguments have been advanced as to why households might be more complex in urban areas, especially in the face of rapid population growth and large rural-urban migration: (1) newly arrived migrants to the city may tend to live with relatives until the newcomers are established; (2) city residents may be forced by the available housing supply to double up, whereas it is easier to build new housing in rural areas.

Income and wealth. A common assumption is that large and complex residential families tend to be associated with wealth and high income, although some see extreme poverty leading to coresidence as a matter of necessity and mutual help. The prevailing view is that mean household size is larger and complexity of household structure is greater among the rich than the poor. Limited demographic data are consistent with this generalization. The United Nations (1973) data for several countries show a moderately strong positive relation between income and headship rates. That is, poor adults are less apt to head their own households and thus are more apt to live with someone else, often a richer relative or an employer.

Determinants of Household Structure. Although the theory of household formation is not well developed, it clearly lends itself to a broad behavioral model of choice guided by tastes or preferences in the face of constraints. In a discussion of constraints, it is convenient to distinguish two broad classes: (1) biological or demographic, relating to the number and type of persons, especially related persons, with whom one might choose to live; (2) economic, relating to the availability of resources with which to establish households, both at the macrolevel (for example, the stock of housing) or at the microlevel (for example, one's income).

Demographic constraints: the supply of kin. A growing body of demographic literature explores the coexistence of kin, or the simultaneous survival of kin of specified types. One of the earliest formal approaches to this problem estimated rates of orphanhood from data on mortality and the average age of childbearing (Lotka, 1931). Later work focused on the effects of lower mortality on various aspects of the typical family life cycle, including marriage duration (the coexistence of husband and wife) and probabilities of orphanhood. The effects of demographic variation (in fertility and mortality) on the possibility of actually exercising culturally preferred marriage patterns and other closely related themes have been pursued by cultural anthropologists.

The effects of mortality level on the likelihood of a man being survived by at least one son during his old age have been demonstrated, and high mortality has been identified as a major constraint on the complexity of actual household structure in premodern populations. Analysis of average household size in stable populations,

with different rules of household residence for married persons, and mortality and fertility varying across wide ranges, showed that extended-family residence rules could yield quite large households indeed (Burch, 1970). Stem-family residence rules produced only moderately large households (7.0 or less), regardless of demographic regime. High mortality reduces household size. There is also a strong effect of fertility level on household size and structure, primarily through its influence on age composition.

Empirical studies of the U.S. population showed, for the period 1940 to 1970, broad increases in headship rates for adults, and an especially great increase in the relative numbers of persons living alone, especially older divorced and widowed women. The relative number of women aged 35–44 (the daughter generation), with whom widowed and divorced women over 55 (the mother generation) might normally have lived, declined steadily since around 1930 as a result of changing age composition consequent to shifts in fertility. The rise in the proportion of older women living alone is attributed in part to this decline in the relative number of younger female relatives (Kobrin, 1976).

There has been a sizable advance in demographic thinking about kinship with the use of one-sex stable population models for three major population types— (1) high fertility and high mortality; (2) high fertility and low mortality; (3) low fertility and low mortality—and calculation of the number of surviving kin of each type that a woman would have at each age of her life (Goodman, Keyfitz, and Pullum, 1974). The results demonstrate that mortality does indeed sharply limit the number of kin, overall and of any one type. But they also demonstrate, more pointedly than previous work, the powerful influence of fertility level on the number of kin of all types except ascendants in the direct line. That is, an individual has only two parents and four grandparents regardless of fertility level. But the number of relatives of all other categories increases with higher fertility.

A different approach to the study of demographic determinants of household and family size has been taken by Norman B. Ryder (1975). He restricts the term "family" to the nuclear family of husband, wife, and own children. More important is the definition of "family size" in terms of person-years of family life lived over time, rather than in terms of the number of persons alive at any one point. Ryder's results show a general increase in person-years of various kinds of family life as mortality declines from high to moderately low levels. For example, the proportion of fathers without a male heir is reduced by one half, while the length of joint married life increases from nineteen to thirty-six years. Each child lives almost twice as long within the family setting, and the propor-

tion of family life in which there is only one surviving parent is cut from one-third to one-tenth. Methodologically, Ryder's work was one of the first modeling exercises to calculate variances as well as mean values for several of the household and family measures derived and to emphasize the important role of variation in household decision making. Such variation might invalidate generalizations based on small samples.

There remains the task of integrating Ryder's results, which focus on nuclear kin, with the work of Burch (1970) and Coale (1965), which focuses on extended-family households, and with research that focuses on extended kin regardless of residence. For example, in a situation of high fertility and high mortality, an individual would not have been so deprived of kinship interaction (including coresidence) as Ryder implies. Even though nuclear kin are curtailed by mortality, there are abundant other kin as a consequence of high fertility. Under the model of high fertility and low mortality, opportunities for kin interaction may become overwhelming.

Equilibrating processes: offsetting demographic constraints. The previous section emphasizes the limitations imposed by demographic conditions on household and family structure, or the ways in which demographic conditions may favor certain forms. A qualifying theme emphasizes the fluidity of household, family, and kinship structures, how they can be and often have been modified independently of biological or demographic constraints to accord more closely with functional need or convenience. This countertheme may be summarized in two brief propositions: (1) in many, perhaps most, societies the viable or optimum household is one that is neither too large nor too small, but medium-sized, say in the range 4 to 6, with at least two adults; (2) there is a widespread tendency for people to strive to reach such optimum households by the addition or subtraction of kin or others, in keeping with institutionalized rules for such additions or subtractions.

Census microdata for Guatemala City give evidence for adjustments in household size and composition by "incomplete" or "truncated" nuclear families (van der Tak and Gendell, 1973). Households headed by either a male or a female with no spouse present were more apt to contain one or more relatives from the extended family. The tendency was stronger for male heads without spouses, suggesting greater need for assistance from relatives. Burch (1967) noted that, in Panama, households with smaller numbers of children were more likely to include relatives from the extended family.

Strong evidence for the process of kin aggregation so as to avoid very large or very small households has been found in eighteenth-century Japan (Eng and Smith, 1976). In order to survive on a small farm, a peasant

needed the work of his wife and a grown son. The absence or loss of such family members was made up for through marriage, remarriage, or adoption, and an excess was offset through marriage or migration. Households that failed to adjust tended to lose their farms and to disappear from the rolls. Similar practices have been noted in historical Europe.

Inheritance and land tenure systems. Patterns of land tenure and inheritance are commonly assumed to have important implications for family and household structure, especially in largely agrarian societies. Systems that discourage division of holdings among heirs are generally thought to result in larger and more complex households.

Evidence from seventeenth- and eighteenth-century Germany, however, shows more complex results with inheritance systems (partible or impartible) affecting marriage patterns and out-migration rates, and through these both family and household structure and rates of population increase (Berkner, 1977). Impartible inheritance acted to slow population growth while partibility created population pressures that in turn led to more complex forms of household organization.

Hammel and Wachter (1977) show how a relatively minor shift in inheritance rules, say, from primonuptial rules to ultimonuptial rules, can lead to a sharp drop in the proportion of stem-family households, from 46 to 21 percent, that is, to sizable change in household structure.

Consequences of Family and Household Structure. There are large bodies of literature on the effects of family composition and formation on intelligence and personality development, on the economic implications of household structure, on the implications of family composition for female labor-force participation, and on problems of dependency and isolation, especially among the aged, to mention only a few major topics. The focus here will be limited to the effects of family and household composition on two other demographic variables, fertility and physical mobility.

Household structure, migration, and moving. In his pioneering work on physical mobility, *Why Families Move* (1955), Peter H. Rossi found that many moves were related to life cycle stages and thus to household size and composition. A number of empirical studies since have sought to clarify these relationships.

A detailed British survey (Donnison, 1961) found that households were at their most mobile in the early stages of family growth. Studies of intraurban mobility emphasize the importance of household composition, especially the number and ages of children.

In a Rhode Island sample, for example, an effect of life-cycle stage, including presence or absence of school-age children, was found, and it was independent of age, marital status, tenure (own or rent home), or duration of residence (Speare, 1970). Also, a moderate negative relationship has been noted between a crowding ratio (persons per room) and residential satisfaction, and between residential satisfaction and actual mobility, suggesting that mobility is a response to increasing household size (Speare, 1974).

It is generally thought that changes in household size and composition to larger and more complex forms motivate local moves as a form of housing adjustment, whereas larger and more complex households discourage migration because of the costs. But some authors have found a more complex relationship of number of children to mobility, illustrating the difficulties of confident generalizations.

Family structure and fertility. One of the most widely cited theses on the consequences of family structure is that extended-family systems promote early marriage and high marital fertility, although that thesis has generally not been supported by empirical studies.

Most empirical studies, however, have confined their analysis to residential households, ignoring relations within kin networks; and many studies have used variables with an inappropriate temporal reference, as, for example, relating cumulative fertility to current household status of the woman.

A recent approach (Bebarta, 1977) deals with this latter problem by relating cumulative fertility to the woman's residential household history. Still, empirical studies to date, while interesting in their own right as investigations of the relations between fertility and residential household formation, have largely failed to deal with the broader questions of how social and economic interdependencies among dispersed kin groups affect marriage and fertility decisions.

Conclusions. The last two decades have seen a substantial increase in demographic and closely related literature on households and families. But compared to the subfields of natality or migration, household and family demography still is immature. Documentation of key generalizations is not yet firmly established; theory of determinants and consequences is sketchy and *ad hoc.*

Over the next years, the following needs must be addressed.

1. There is need for recognition once and for all that both coresidence of kin and interaction among kin living in different households or communities are important aspects of family life, with important social and economic implications. In view of the disproportionate body of evidence relating to coresidential groups, a special effort will have to be made to avoid slighting of kinship relationships.

2. Related to this need is the need to relate descriptive demographic studies of household and family to broader

perspectives of economics, anthropology, and sociology, partly in order to highlight the substantive importance of the demographic material.

3. There is need for further clarification by modeling and simulation of the basic relationships among fertility, nuptiality, and mortality on the one hand and household and family size and structure on the other—what might be called the substantive formal demography of the family. Most modeling to date has dealt with comparative statics, using stable population models. Clarification of household and family demographic dynamics during periods of demographic transition is in order.

4. Theoretically, there is need to develop explicitly the model of decision making by couples and individuals that is implicit in existing literature on household structure and change, a development that would parallel that of explicit decision-making models in the study of fertility and migration.

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See also HISTORICAL DEMOGRAPHY; MARRIAGE AND DIVORCE. *For sources of data, see* DATA COLLECTION, *article on* NATIONAL SYSTEMS.

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HUMAN ECOLOGY

See ECOLOGY.

I

IMMIGRATION POLICY

The following article is limited to a discussion of immigration policy in the United States.

The policy of the United States on immigration has varied greatly over the decades, with consequent swings in the number of persons admitted. This article describes the development of U.S. immigration policy, traces the course of changes in the number and characteristics of immigrants, and briefly outlines the major issues as the United States forges an immigration policy in the early 1980s that will address the problems of illegal migration and refugee resettlement, as well as the need, desirability, and capacity to continue a tradition of encouraging large-scale immigration.

The entire history of U.S. immigration policy is one of ambivalence. On the one hand, the country has historically been a refuge, a place of new beginnings, accepting and even recruiting new settlers to build the nation and its economy. On the other hand, protectionism has resulted from apprehension over the capacity of the culture and the economy to assimilate newcomers, over the ability of the work force to compete with "cheap and docile" labor, and even over genetic and cultural "pollution" emanating from nativist and racist theories. The history of immigration policy is a dialectic of these two themes of acceptance of immigrants and protection of citizens.

Free Movement: 1790–1875. At the first census in 1790 the recorded population of the United States was 3,227,000. About 75 percent of this population was of British origin, either direct immigrants or the descendants of seventeenth- and eighteenth-century immigrants. In addition, about half a million black slaves and about as many indigenous Americans lived within the new nation. Germans, mostly concentrated in Pennsylvania, were the largest non-English-speaking immigrant group. Other areas of the continent, which were later annexed by purchase or war, were populated by Spanish and French settlers who had followed the conquistadors, explorers, and missionaries in the Southwest, Louisiana, and the Great Lakes area. Indigenous Americans also inhabited these and other areas of the continent.

The U.S. Constitution said nothing about regulating immigration except for permitting (Article 1, Section 9, Part 1) the importation of slaves until 1808, after which Congress could, and did, prohibit it. In 1798, the Alien and Sedition Act empowered the president to deport any alien he considered dangerous, but this power was authorized for only two years and was not renewed. No other policy was developed regarding immigration during the early days of the republic. Not until 1819 was an effort begun to count immigrants. Ships' masters were required to supply the collector of customs with lists of passengers by name, sex, age, occupation, and "country to which they severally belong." Only Atlantic and Gulf of Mexico ports were covered at first; Pacific ports were added after 1850. Information on Hawaii, Puerto Rico, and Alaska dates from the beginning of the twentieth century. Not until 1910 was regular data collection on

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movement over land borders with Canada and Mexico institutionalized.

Until 1875, in fact, there were no federal laws encouraging or forbidding immigration. There were laws regulating conditions on ships, which indirectly affected the size of immigration and the health conditions of immigrants.

Between 1790 and 1820, only about one quarter of a million persons are estimated to have immigrated. As Figure 1 (p. 313) shows, immigration rose steadily from the 1820s on with a large jump starting in the late 1840s as a result of Irish and German movement. Immigrants were used for economic and geographic expansion: they built transportation systems, provided new labor for factories, and opened up new land in the Middle West. The large numbers entering did not mean that there was universal acceptance; on the contrary, there was strong nativism—opposition to a group because of its foreign connection—which had its roots in events predating the new nation. America's strongest antiforeign tradition originated in the anti-Catholicism of the Protestant Reformation. Catholics were perceived as something of a fifth column, agents of a foreign tyrant, the pope.

A second aspect of nativism was the fear of foreign radicals, manifested early in the Alien Act of 1798. Although created by a revolution, the new nation was seen by many as perfecting a social order requiring little further transformation. Other revolutions toppled an old order and built on its ruins; egalitarian America, with its traditions of social and economic mobility, was assumed to need no second revolution.

The anti-Catholic and antiradical defined what America was not to be. A third nativist tradition defined what America was thought to be and should remain: Anglo-Saxon. Although immigration was largely unhampered during the period from 1790 to 1875, nativist opposition existed and set the stage for later restriction. Nativism was expressed in the Know Nothing movement of the 1840s and 1850s. The movement was based on ethnic and religious bias, worker resentment of competition, and Southern fears of Northern population growth and political power. Successful at the polls in the 1850s, the Know Nothings faded with the onset of Civil War.

Regulation Begins: 1875–1920. The Supreme Court ruled in 1876 that Congress was empowered by the interstate commerce clause to regulate immigration. State laws to control the movement were declared unconstitutional. Between 1875 and 1920, Congress passed three kinds of laws, most focusing on individual characteristics of migrants. The first kind of law prohibited entrance to persons with various physical or mental diseases or whose criminal, moral, or political beliefs or behavior were assumed to make them unfit as residents. The second kind

of law was aimed at reducing competition for American labor. Specifically a series of laws in the 1880s prohibited the entrance of persons with contracts to work in the United States. These contract-labor laws were aimed at the importation of strikebreakers. The third kind of legislation was the precursor of future legislation not aimed at individual characteristics but at the virtual or complete exclusion of whole groups because of race or nationality. In 1882, Chinese were excluded. In 1907, the exclusion was extended to Japanese under the "Gentlemen's Agreement." Ultimately, in 1917 all Asians were excluded.

Nativism in this period led to the adoption and propagation of theories of racial superiority, which served as rationales for restricting immigration numerically and by origin. Throughout the late 1880s right through World War I, the restrictionists agitated to reduce the number of immigrants, especially from eastern and southern Europe, who had begun to come in great numbers in the early 1880s.

National-origins Quotas: 1921–1964. The nativists were finally successful. The national-origins quota acts of the 1920s firmly set the concepts of restricting immigration numerically and by national origin. These acts, passed in 1921 and 1924, limited the amount of immigration from outside the western hemisphere and reserved fixed proportions of the total visa allotment for the exclusive use of natives of specific countries. Asian immigration continued to be barred.

The national-origins quota system remained the basic policy of U.S. immigration until 1965. Periodic challenges to the system resulted in only small changes. The granting in 1943 of a small quota to China, a wartime ally, acknowledged the diplomatic embarrassment of Asiatic exclusion. Special refugee and displaced person programs after World War II prevented quotas from completely determining the ethnic mix.

Despite ideological challenges to the quota system and the bending of immigration quotas to accommodate refugee resettlement and war brides following World War II, Congress continued the general policy in the Immigration and Nationality Act of 1952. Known as the McCarran-Walter Act, this was the first codification of U.S. immigration law. It is still the basic immigration code. The act maintained the national-origins quota concept as the foundation of immigration selection, justifying it not on grounds of racial superiority but by the assimilability of persons with cultural and historical roots similar to those of Americans.

Family Reunion and Labor Needs: 1965–Present. The McCarran-Walter Act of 1952 was passed over President Harry S Truman's veto. His veto message echoed the intense ideological opposition to national-origin quotas. That opposition continued and was supported by

both political party platforms during the 1950s and by President Dwight D. Eisenhower. During President John F. Kennedy's term, a bill was introduced to end the quota system; the outcome was the Immigration Act of 1965, signed into law by President Lyndon B. Johnson.

The 1965 act did away with quotas but extended the concept of numerical limitation to include the western hemisphere. The act also included a preference system for the eastern hemisphere to govern the distribution of visas. (Tables 1 and 2 compare the McCarran-Walter and 1965 preference systems.) In short, the act allotted 170,000 visas per year to be distributed to natives of the eastern hemisphere. Spouses, children, and parents of U.S. citizens, however, could enter outside the 170,000 ceiling. Those entering within the 170,000 ceiling received visas according to the preference system, with the additional restriction that no one country could be accorded more than 20,000 of the 170,000 visas. Finally, all applicants for worker preferences (Table 2, preferences 3 and 6) and nonpreference applicants obtaining any visas unused by those qualifying for a preference were required to obtain labor certification. This was a clearance by the secretary of labor that no American workers were available for the job and that the wages and conditions of U.S. workers would not be hurt by the conditions of work offered the applicant for the visa.

For the western hemisphere, the act mandated a rather mixed-up set of requirements, which resulted from House

TABLE 1. *Preference system of the Immigration and Nationality Act of 1952*

1. *First preference:* Highly skilled immigrants whose services are urgently needed in the United States, and the spouse and children of such immigrants.
   60 percent plus any not required for second and third preferences
2. *Second preference:* Parents of citizens over the age of 21, and unmarried sons and daughters of U.S. citizens.
   30 percent plus any not required for first and third preferences
3. *Third preference:* Spouse and unmarried sons and daughters of an alien lawfully admitted for permanent residence.
   20 percent plus any not required for first or second preference
4. *Fourth preference:* Brothers, sisters, and married sons and daughters of U.S. citizens, and any accompanying spouse and children.
   50 percent of numbers not required for first three preferences
5. *Nonpreference:* Applicants not entitled to one of the above preferences.
   50 percent of numbers not required for first three preferences, plus any not required for fourth

Source of data: United States, Bureau of Security and Consular Affairs, 1968, p. 68.

TABLE 2. *Preference system of the Immigration Act of 1965*

1. *First preference:* Unmarried sons and daughters of U.S. citizens.
   Not more than 20 percent
2. *Second preference:* Spouse and unmarried sons and daughters of an alien lawfully admitted for permanent residence.
   20 percent plus any not required for first preference
3. *Third preference:* Members of the professions and scientists and artists of exceptional ability.
   Not more than 10 percent
4. *Fourth preference:* Married sons and daughters of U.S. citizens.
   10 percent plus any not required for first three preferences
5. *Fifth preference:* Brothers and sisters of U.S. citizens.[1]
   24 percent plus any not required for first four preferences
6. *Sixth preference:* Skilled and unskilled workers in occupations for which labor is in short supply in the United States.
   Not more than 10 percent
7. *Seventh preference:* Refugees to whom conditional entry or adjustment of status may be granted.
   Not more than 6 percent
8. *Nonpreference:* Any applicant not entitled to one of the above preferences.
   Any numbers not required for preference applicants

[1] Amended in 1976 to require U.S. citizens conferring benefit to be over 21 years of age.
Source of data: United States, Bureau of Security and Consular Affairs, 1968, p. 68.

and Senate squabbling on how to limit western hemisphere immigration. The basic policy as of 1 July 1968 was that 120,000 visas were reserved for western hemisphere natives, exclusive of spouses, children, and parents of U.S. citizens, who were exempt from the ceiling. There was no preference system and no per-country limit, and all were required to have labor certification unless the applicant was the spouse, child, or parent of a U.S. citizen or of a legal immigrant. This policy, and the use of a large number of western hemisphere visas for Cuban refugees, led to long waiting lines for western hemisphere applicants. The long lines, the difficulty of getting a labor clearance, and the end in 1964 of the Bracero program for temporary labor with Mexico resulted in illegal migration from Mexico, the Caribbean, and nations in Central America and the northern part of South America.

In 1976, the provisions for the western hemisphere were made to conform to those for the rest of the world. The two parallel but separate systems, with the same set of preferences (Table 2)—20,000 per country limit and labor certification requirements—were the same in all respects except the limits of 120,000 for the western hemisphere and 170,000 for the rest of the world. In 1978, the two separate systems were merged into a single system

with a ceiling of 290,000. Table 3 summarizes these various policies between 1952 and 1978.

On 17 March 1980 a Refugee Act was signed into law that altered the process for refugee admissions. The official definition of "refugee" had limited refugee status to persons from countries with communist governments or from the Middle East. This restrictive definition and the allotment of only 6 percent of total visas to refugees (17,400 of the 290,000) led to the use of the parole provision for refugee admittance. This provision empowers the attorney general to admit for up to two years any person whose entry is deemed in the national interest. Originally the provision was intended for individual admissions for such things as emergency medical care, but it had been used to admit large numbers of Hungarian, Cuban, Czechoslovakian, and Indochinese refugees, and smaller groups, such as Chileans, and Indians from Uganda. In each situation, Congress was required to pass special legislation to permit adjustment from parole to immigrant status, but, in reality, it had little choice but to acquiesce in the matter.

The 1980 Refugee Act enlarged the scope of the defini-

TABLE 3. *Major provisions of recent U.S. immigration acts*

Provisions	1952	1965[3]	1976	1978
Ceilings				
EH	158,561	170,000	170,000	None
WH	None	120,000	120,000	None
Total	158,561 plus	290,000	290,000	290,000
Exempt from ceilings				
EH	Spouse and children of adult U.S. citizens	Parents, spouse, and children of adult U.S. citizens	Parents, spouse, and children of adult U.S. citizens	Parents, spouse, and children of adult U.S. citizens
WH	No ceiling	Parents, spouse, and children of adult U.S. citizens	Parents, spouse, and children of adult U.S. citizens	Parents, spouse, and children of adult U.S. citizens
Country quotas or ceilings				
EH	Proportionate to 1920 U.S. ethnic composition	20,000	20,000	20,000
WH	None	None	20,000	20,000
Preference system[1]				
EH	4 preferences	7 preferences	7 preferences[4]	7 preferences[4]
WH	None	None	7 preferences[4]	7 preferences[4]
Labor certification				
EH	By complaint[2]	3d, 6th, non-preference	3d, 6th, non-preference	3d, 6th, non-preference
WH	By complaint[2]	All except immediate family of citizens and of permanent resident aliens	3d, 6th, non-preference	3d, 6th, non-preference

EH = eastern hemisphere.   WH = western hemisphere.

[1] See tables 1 and 2. The percentages apply to the country ceilings in the 1952 act, to hemisphere ceiling in 1965 and 1976, and the worldwide ceiling of 1978.

[2] No prior certification prescribed in 1952 act. A complaint had to be lodged or an employer had to petition for 25 or more applicants before a Department of Labor review was initiated.

[3] Provisions listed refer to system as of 1968, after elimination of quota system of 1952 act and imposition of western hemisphere ceiling.
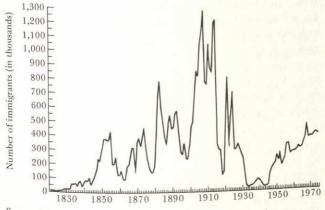
[4] The 1976 act provided that if a country met the 20,000 ceiling in any year, for the next year the preference proportions would apply to the 20,000 ceiling rather than the hemispheric or worldwide ceilings. This is to ensure that lower-preference and nonpreference applicants do not get squeezed out because of demands in the higher preferences. This provision is invoked in only a few countries where third-preference demand is especially high.

tion of refugee to conform with the United Nations definition—basically any person who faces persecution or has a well-founded fear of persecution on account of race, religion, nationality, political belief, or membership in a social group. The law eliminated the seventh preference and reduced the worldwide ceiling to 270,000. However, up to 50,000 refugees are permitted to enter each year over the new 270,000 ceiling, with provisions to increase refugee admissions after presidential and congressional consultation in case of a compelling emergency. Congress will review this number prior to fiscal year 1983 to determine whether to adjust or retain the 50,000 figure. The parole authority can no longer be used for refugee admissions.

Numbers and Characteristics of U.S. Immigrants. Figure 1 gives an indication of the volume of immigration since the initiation of records. The graph records the gross legal immigration from official statistics. The limitations of the scope of data collection mentioned previously, the significant emigration especially during this century, and the illegal migration ever since federal regulation began should be kept in mind.

Five sets of peaks and troughs are immediately evident from Figure 1. The increase resulting from Irish and German migration in the 1840s and early 1850s was followed by a decline in the face of growing opposition and the Civil War. Another increase following the war and economic expansion (e.g., railroad building) was followed by a fall resulting from declining foreign investment and economic recession beginning in 1872. Another rise in the 1880s, associated with the new immigration from southern and eastern Europe, was followed by a decline in connection with the recession of 1893–1897. The period 1900–1914 saw the all-time peak; in 1907, almost 1.3 million entries were recorded. World War I led to a sharp decline, then flow increased again in the 1920s, despite

the early quota laws. The imposition in 1929 of the more restrictive provisions of the quota act of 1924, followed by the Great Depression and World War II, led to another decline.

Since the end of World War II, there has been a steady increase in movement. A sharp upward movement was recorded in 1979 (not shown on Figure 1) when large-scale Indochinese refugee admissions lifted the total immigration to more than 600,000 entries in one year.

Over the years, the origins of immigrants have shifted from northern and western Europe to southern and eastern Europe. In this century, migration of people from the western hemisphere has also been large. Canada and Mexico have both been major contributors. Asian migration was minimal, because of first, Asiatic exclusion, then the small quotas allotted to Asian countries, and finally special limits on those of Asian ancestry, despite place of birth, in the McCarran-Walter Act of 1952.

Since the 1965 Immigration Act, European migration has declined absolutely and as a proportion of the total. Southern and eastern Europeans dominate this reduced European flow. Asian immigration has increased tremendously. In the Americas, immigration has increased somewhat as a proportion of total movement, but Canadian movement has been much reduced and Mexican and Caribbean immigrants have increased.

The occupational makeup of immigrants has also altered. Laborers and agricultural peasants dominated until the end of World War II. There were exceptions, of course, such as refugees from the abortive revolts of 1848 and small numbers of Jewish refugees in the 1930s, including intellectuals who made spectacular contributions in the arts and sciences. More recent movement, however, has included a larger proportion of professional, technical, and kindred workers (PTK's). Even before the 1965 act, in the years 1961–1965 about 20 percent of all immigrants who indicated their occupation were PTK's. In the eight years after the act was fully implemented (1969–1976), 27.4 percent were PTK's. In both time periods, blue-collar workers have slightly outnumbered white-collar workers by a margin of approximately 53–47 percent.

Perhaps of most importance is that the origin of PTK's and other white-collar workers has shifted greatly to Asian nations. Between 1961 and 1965, Asia accounted for less than 10 percent of all PTK's, but between 1969 and 1976, it accounted for 58 percent. In the same period, Europe's contribution to the PTK flow to the United States fell from 46 percent to 19 percent and North America's (primarily Canada) from 32 percent to 13 percent. While Africa's contribution rose from 1.6 to about 4.5 percent, Southern America's declined from 10 to 4 percent. Thus, the "brain drain" switched from Europe and Canada to Third World countries, although not

FIGURE 1. *U.S. immigration levels, 1825–1975*

Source of data: U.S. Immigration and Naturalization Service.

universally so, since Latin American contribution to PTK immigration declined.

In short, U.S. immigration has followed a pattern of "boom and bust": immigration peaks followed by troughs related to wartime travel problems and economic downturns. Since World War II there has been a steady and significant rise from a very low level.

Current migration is heavily from Third World countries. Asia and Latin America (including the Caribbean) dominate as sending sources. Although a large Latin movement has existed during this century, the Asian movement is a new phenomenon. The size and proportionate contribution of traditional European flows have declined. The change in origin has been accompanied by a change in skill levels, especially an increase in PTK's among white-collar workers. This movement of highly skilled manpower also comes predominately from Third World countries in Asia and, to a lesser extent, in Africa.

Future Prospects. In 1978, Congress established the Select Commission on Immigration and Refugee Policy in the United States to review the entire scope of immigration, refugee, and naturalization law and administration. This action fits the pattern of the other major receiving countries, Australia and Canada, which mounted national enquiries followed by policy changes in the mid-1970s to late 1970s.

The commission was composed of eight members of Congress (four from each chamber), four cabinet secretaries, and four public members, and published its report and recommendations in March 1981. This report (United States, Congress, 1981) has begun to be grist for the legislative mill, where bills have to be introduced, debated, amended, and so on before the law is altered. The outcome of this process is uncertain and it will probably be 1983 or 1984 before a legislative package, if any, is passed. "If any" is inserted to underscore the historical ambivalence and deep emotion surrounding the topic of immigration in America.

Certain historical trends are worth noting as a guide to possible directions of change. There has been a movement away from ethnic and racial discrimination in immigration law, a trend that is supported in the domestic context by the civil rights movement led by American blacks. The trend since the 1965 act has been toward a single, worldwide system, a system that has increasingly placed limits on open-ended categories—the western hemisphere in 1965 and on the use of parole power in 1980—and, although refugee admissions can be increased for emergencies, the process is now more controlled. A movement to put an overall ceiling on immigration, including the immediate family (spouse, children, and parents) of U.S. citizens, would not be surprising. One approach currently discussed is a multiyear ceiling. Within that, refugees and immigrants would have to be accommodated. If refugee admittance rose because of emergency, then immigrant or refugee entrance in subsequent years would have to decline to stay within the multiyear target.

There are a number of other questions besides how to maintain flexibility in the allocation of visas within an overall ceiling. Illegal migration is the dominant issue in terms of public awareness. Other issues include the overall level of numbers, the impact on the labor force, and the effect of the high proportion of immigrants with a Spanish culture and language heritage on U.S. society and political culture. (Between 1967 and 1976 about 30 percent of legal immigrants came from Spanish-speaking countries, augmented by a large number of illegal migrants. Previous high concentrations were 28 percent German-speaking in 1881–1890 and 23 percent Italian-speaking in 1901-1910.)

Underlying most of these issues are two concerns: limits to growth and political culture. Both concerns are not entirely new, although limits to growth is a new and broader context and conceptualization of some older concerns. Previously, the limits concerns were centered largely on the labor force (still a major concern) and the capacity to absorb people given the close of the frontier and the overcrowded cities. Formerly, there was a fertility concern, namely that influxes of immigrants led to *reduced* native fertility, but current concern is directed to the high relative contribution of immigration to population growth as fertility declines or stays low.

In short, the United States once again is addressing the question of immigration policy. Many of the topics seem to be old issues in new dress—labor impact, ethnic origin, assimilability, impact on the political culture, even the need for immigrants at all and the ability of the United States to absorb them. The same answers are also being given: families should not be kept apart; the United States should be generous in accepting refugees to be true to its heritage and to enhance its current foreign policy; and the United States still needs workers, especially in the face of a labor shortage predicted by some for the late 1980s and beyond. It is too early to foresee the compromises that will emerge from these contrary points of view. Clearly the United States remains ambivalent about immigrants.

Charles B. Keely

See also INTERNATIONAL MIGRATION; POPULATION POLICY, *article on* UNITED STATES.

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INDEXES, NUPTIALITY

See Nuptiality indexes.

INDIA

With a population exceeding 684 million on 1 March 1981, India is the second largest nation in the world (after China), accounting for about 15 percent of the total world population and more than 21 percent of the population of the developing world. During the thirty-year period 1951–1981, India's population increased by 89 percent, gaining 323 million people. The average annual growth rate during this period (nearly 2.1 percent) was higher than during the preceding decade (1.25 percent) because mortality declined faster than fertility. There are indications that the birth rate has begun to decline; but just as significantly, the decline in mortality has slowed down. The growth rate has remained stable during 1961–1981, a little over 2.2 percent. If this rate were to remain unchanged, India's population would easily cross the 1 billion mark by about the year 2000.

Location, Geography, and Land Use. India is an independent federation in South Asia, located entirely in the northern hemisphere (between latitudes 8°4′ and 37°6′ north and longitudes 68°7′ and 97°25′ east) and covering a large part of the Indian subcontinent. It has a land area of 3.28 million square kilometers (1.27 million square miles), with the mainland measuring about 3,200 kilometers (1,984 miles) from north to south and about 2,900 kilometers (1,798 miles) from east to west, both at the extremes. In terms of land area, India ranks seventh in the world. It has long borders with Pakistan to the west and Bangladesh and Burma to the east. Other countries on its borders include China, Nepal, and Bhutan to the north. The Himalayas, stretching clear across the north and dipping southward at the eastern and western ends, effectively separate India, Bangladesh, and Pakistan from the rest of Asia. The southern peninsula is surrounded by the Indian Ocean, with the Arabian Sea to the west and the Bay of Bengal to the east. The coastline measures about 5,700 kilometers, and the land frontier is about 15,200 kilometers long.

According to the provisional land utilization statistics available for 1974–1975, covering 93 percent of the total land area of India (329 million hectares), about 138 million hectares (45 percent) were sown for crops, 26 million hectares more than once. Forests cover 66 million hectares, permanent pastures and grazing lands 13 million hectares, and tree crops and groves 4 million hectares. About 24 million hectares are classified as barren and uncultivable, and 17 million are put to nonagricultural use. Cultivable waste and current and other fallows are estimated at 17 and 26 million hectares, respectively.

More than 80 percent of the total area devoted to the cultivation of food grains (126 million hectares during 1973–1974) is used to grow cereals; the remainder is under pulses (for example, peas, gram, tur). Rice is the main crop, accounting for about 30 percent of the area raising food grains. Wheat is the next most important crop (15 percent of total area), with the two millet crops—jowar (sorghum) and bajra—accounting for a total of about 24 percent of food grain acreage.

Population Characteristics. Data from decennial censuses dating back to 1881 provide reasonably good information about the growth rate of India's population. Population growth was slow until 1921 because of the frequent epidemics of plague and cholera, famines, and the influenza epidemic of 1918–1919. During 1921–1951, the average decennial growth was around 13 percent; after 1951 it increased rather sharply to 21.6 percent during 1951–1961 and 24.8 percent during 1961–1971 and 1971–1981. The 1961 census count exceeded all prior projections, but the 1971 census reported a population that was about 14 million fewer than expected (561 million) according to the official population projections. The 1981 census count has once again exceeded the projected figure (672 million) used by the Indian Planning Commission.

The sharp acceleration of the rate of population growth during 1951–1961, after relatively stable growth

during 1931–1951, is generally attributed to the control of malaria and infectious diseases, including tuberculosis, during the 1950s. Yet, according to knowledgeable observers, estimates of mortality levels during 1951–1960 overstated the gains in longevity and led to an over-optimistic projection of the likely further decline in mortality during the 1960s.

Compared to its neighbors as well as to many other developing countries, India's population growth rate is low and has not increased significantly since the 1950s. This seems to be the result primarily of a relatively high level of mortality. In addition, the birth rate seems to be lower than in Pakistan or Bangladesh.

Density. While India accounts for about 15 percent of the world's total population, it has only 2.4 percent of the total world area. Average population density in India (excluding Jammu and Kashmir) in 1981 was 221 persons per square kilometer, as compared to 177 in 1971, 142 in 1961, and about 80 prior to 1921. Kerala and West Bengal had very high densities of 654 and 614. The low-density states include hilly regions such as Himachal

Pradesh, Manipur, Meghalaya, Nagaland, and the largely semiarid Rajasthan, all with a density of 100 or fewer persons per square kilometer (see Table 1).

Urbanization. In 1981, only 24 percent of the population (excluding the states of Assam and Jammu and Kashmir) lived in urban areas. Among the states, the percentage of urban population varied from about 35 percent in Maharashtra and 33 percent in Tamil Nadu to about 8 percent in Himachal Pradesh and 12 percent in Bihar and Orissa (see Table 1).

About 60 percent of the total urban population in 1981 lived in 216 towns or urban agglomerations of 100,000 or more population, which accounted for only 6.7 percent of the total number of towns. During 1971–1981 urban population grew about 46 percent as compared to 38 percent during 1961–1971 and 26 percent during 1941–1951. The rate of urbanization seems to have accelerated during the 1970s largely because several former villages have been reclassified as towns. Urban growth as well as the pace of urbanization during the 1950s were substantially slower than during 1941–1951,

TABLE 1. *Selected indexes of population of India by state and union territory, 1981*

State/Union Territory	1981 Population (thousands)	Density per sq km (1981)	Growth rate 1971–81	Sex ratio 1981	% literate in 1981			% living in urban areas 1981	Birth rate 1976–78	Death rate 1976–78	% of effectively protected couples (Mar. 80)
					Males	Females	Total				
INDIA	683,810	221	24.75	1,069	46.7[a]	24.9[a]	36.2[a]	23.73[a]	33.3[b]	14.5[b]	22.6
States											
Andhra Pradesh	53,404	194	22.76	1,025	39.1	20.5	29.9	23.25	33.2	14.0	26.7
Assam	19,903	254	36.09	1,111	36.7	18.6	28.2	8.90	31.3	13.7	19.3
Bihar	69,823	402	23.90	1,056	37.8	13.6	26.0	12.46	29.7	12.3	12.3
Gujarat	33,961	173	27.21	1,061	54.5	32.3	43.8	31.08	36.5	14.3	32.8
Haryana	12,851	291	28.04	1,140	47.8	22.2	35.8	21.96	34.7	13.3	30.3
Himachal Pradesh	4,238	76	22.46	1,012	52.4	31.4	41.9	7.72	30.7	12.3	23.8
Jammu & Kashmir	5,982	—	29.57	1.049	26.8	9.3	18.6	18.60	31.9	11.5	10.3
Karnataka	37,043	193	26.43	1,038	48.6	27.8	38.4	28.91	28.3	11.6	22.9
Kerala	25,403	654	19.00	967	74.0	64.5	69.2	18.78	26.4	7.5	29.4
Madhya Pradesh	52,132	118	25.15	1,063	39.4	15.5	27.8	20.31	38.4	16.5	21.1
Maharashtra	62,694	204	24.36	1,066	58.9	35.1	47.4	35.08	27.5	11.5	35.2
Manipur	1,434	64	33.65	1,029	53.0	30.7	42.0	26.44	28.1	6.9	9.9
Meghalaya	1,328	59	31.25	1,046	37.0	29.3	33.2	18.03	32.6	13.2	6.4
Nagaland	773	47	49.73	1,154	49.2	33.7	42.0	15.54	21.4	6.8	1.0
Orissa	26,272	169	19.72	1,018	46.9	21.1	34.1	11.82	32.6	15.5	24.8
Punjab	16,670	331	23.01	1,129	46.6	34.1	40.7	27.72	30.7	11.1	25.0
Rajasthan	34,103	100	32.36	1,085	35.8	11.3	24.7	20.93	34.2	15.0	13.3
Sikkim	316	44	50.44	1,196	43.6	22.1	33.8	16.23	n.a.	n.a.	10.0
Tamil Nadu	48,297	371	17.23	1,023	57.2	34.1	45.8	32.98	29.8	13.7	28.6
Tripura	2,060	196	32.37	1,055	51.0	31.6	41.6	10.98	30.5	10.4	9.6
Uttar Pradesh	110,858	377	25.49	1,129	38.9	14.4	27.4	18.01	40.3	20.0	11.6
West Bengal	54,486	614	22.96	1,097	50.5	30.3	40.9	26.49	30.8	11.7	22.0
Union Territories											
Andaman & Nicobar Islands	188	23	63.51	1,314	58.4	41.8	51.3	26.36	36.3	8.6	15.0
Arunachal Pradesh	628	7	34.34	1,150	28.0	11.0	20.1	6.32	33.8	19.5	1.7
Chandigarh	450	3,948	74.95	1,298	68.8	59.3	64.7	93.60	29.4	4.3	24.7
Dadra & Nagar Haveli	104	211	39.78	1,026	36.2	16.8	26.6	6.67	37.4	17.6	15.7
Delhi	6,196	4,178	52.41	1,234	68.0	52.6	61.1	92.84	27.2	8.0	36.1
Goa, Daman, & Diu	1.082	284	26.15	1,019	64.8	46.8	55.9	32.46	21.8	9.3	16.3
Lakshadweep Island	40	1,257	26.49	1.025	65.0	44.2	54.7	46.31	31.9	8.7	7.6
Mizoram	488	23	46.75	1,069	66.0	52.6	59.5	25.17	n.a.	n.a.	10.5
Pondicherry	604	1,228	28.07	1,015	64.0	44.3	54.2	52.32	29.1	10.9	36.2

[a]All-India estimates exclude Assam and Jammu and Kashmir. For these two states, literacy rates and percent living in urban areas are shown for 1971.   [b]All-India estimates exclude Bihar and West Bengal. Estimates for Bihar are for 1975–1977.   n.a. = not available.
Sources of data. India, Ministry of Health and Family Welfare, 1980. India, Office of the Registrar General, 1980, 1981.

when a large proportion of refugees from Pakistan settled in urban areas.

India's rural population of 524 million lives in about 576,000 villages, over 70 percent of which have fewer than 1,000 persons each. In 1971, 6,333 villages had a population of 5,000 or more, and about 32 percent of these larger villages were located in the two states of Kerala and Tamil Nadu. The average population of a village in 1971 was only 762 (about 17 percent above the 1961 figure of 650). Except in some areas on the west coast and in the northeastern states, villages consist of spatially contiguous houses with farm land on the periphery.

Households. The Indian census defines a household as a group of persons living together and taking their food from a common kitchen. The 1971 census enumerated 100.4 million households, of which 20.9 million were in urban areas. The average household size was 5.46 persons (5.52 in rural areas and 5.23 in urban areas), about 6 percent higher than in 1961 (5.16 average for the country; 5.20 and 4.97 in rural and urban areas, respectively). These data suggest that extended-family or joint-family living arrangements are not very widespread; but they do not rule out the probable importance of joint-family living during certain phases of the life cycle.

Sex ratios. India is one of the few countries with an excess of males (or a deficit of females). The 1981 census counted 23 million more males than females. The sex ratio had been gradually increasing, from 1,029 males per thousand females in 1901 to 1,075 in 1971, but had declined to 1,069 in 1981. This persistent anomalous feature of India's population shows large interregional variations but, except for Kerala, all states show an excess of males. Reasons for the rise in the sex ratio of the population during 1951–1971 and the recent decline are difficult to identify.

Age data. Age data show a strong preference for reporting ages ending with digits "0" or "5" and "2" or "8." Nevertheless, age data by broad age groups do reflect the high dependency ratio (population in the age group 0–14 and 60 and over divided by the population in the working ages of 15–59) that arises from continued high fertility. The dependency ratio rose to 92 in 1971 from 88 in 1961.

Marriage. Estimated on the basis of the census proportions of single or never-married persons in each age group, the mean marriage age was 22.4 years for males and 17.1 years for females in 1971, up from 21.6 and 15.9 in 1961. The median age runs higher than the mean: in 1961 it was 18.0 years for females. This was about 2.4 years higher than in 1901 but almost the same as in 1941 (17.5 years). Thus the data on time trends are not entirely clear; but most probably the marriage age, though still

early, is rising. Very young brides are fewer, so that the traditional time interval between formal ceremonies of marriage and the start of cohabitation has been virtually eliminated.

The low marriage age for females is accompanied by virtually universal marriage. The 1961 and 1971 censuses reported only about 0.5 percent of women aged 45–54 as never married. In 1971, less than 1.0 percent of rural and about 3 percent of urban women over age 30 were single.

An important feature of Indian nuptiality is the high (though declining) proportion of widows reported in successive censuses, caused by high mortality and relatively low incidence of remarriage among widows. The widespread impression that widow remarriage is prohibited among Hindus seems to be incorrect, insofar as it is observed strictly only by the higher castes. However, marriage for widows with surviving children is rendered difficult because of problems surrounding inheritance of land and other fixed assets, which may be held by a joint family.

Literacy. According to the 1981 census, 36 percent of the total Indian population were literate. Literacy among males (47 percent) was almost twice as high as among females (25 percent). These figures reflect a considerable advance over the situation reported by the 1951 census, when 17 percent of the total population (24 percent of males and 8 percent of females) were reported to be literate. In fact, these figures understate the extent of progress, because during this period the proportion of the population below age five increased.

In spite of the considerable rise in literacy rates, population growth has led to an increase in the absolute number of illiterates in the total population as well as in the population aged 10 and over. During 1971–1981, the total number of illiterate persons in India increased from 387 to 437 million (by 13 percent).

There exist substantial interstate variations in the level of literacy, which ranges from 69 percent in Kerala to only 24–27 percent in Bihar, Rajasthan, Jammu and Kashmir, and Uttar Pradesh. In every state, the urban literacy level tends to be higher than the rural. In the country as a whole, literacy in urban areas is twice that in rural areas.

Vital rates. Despite the enactment of a Registration of Births and Deaths Act in 1876 during British rule, Indian vital statistics have continued to be deficient in coverage. A national law providing for compulsory registration of births and deaths was enacted in 1969, but its effective implementation continues to be difficult. The attempt to estimate vital rates through national sample surveys (NSS) has been handicapped by defects in respondent recall of all events during the reference period.

In recent years, a better source of data has evolved in

the form of the sample registration scheme (SRS) of the Office of the Registrar General. However, because of inadequate financial allocations, particularly during and after the period of rapid inflation in 1973 and 1974, and because of relatively limited analytical work on the data collected by the SRS system, the high expectations it raised in the initial years have not really been fulfilled. Most analysts consider the estimated birth rates for several states, presented in Table 1, to be implausibly low. Therefore, some uncertainty persists about the prevailing levels of fertility and mortality and trends therein in several parts of the country.

Table 2 shows the SRS estimates of birth, death, and natural increase rates during 1970–1978, which cover nearly 82 percent of the total population of India. According to these data, the birth rate has declined from about 37 per 1,000 during 1970–1972 to 33 per 1,000 during 1977–1978. The death rate has fluctuated between 15 and 17 per 1,000 over most of the period; but it is possible that beginning with 1975, mortality has resumed a downward trend.

The results of the 1981 census seem to confirm a widespread impression that both births and deaths are underreported to some extent in the SRS. The rate of natural increase estimated from the SRS has been significantly below the rate of population growth during the intercensal period 1971–1981 and the differences cannot be attributed to interstate migration. For the country as a whole, the rate of natural increase has remained stable around an average (annual intercensal rate) of 2.2 percent during both 1961–1971 and 1971–1981.

According to estimates of mortality and fertility, based on the application of the stable and quasi-stable models to the age distributions reported by successive censuses and the intercensal rate of growth, the life expectancy at birth during 1961–1971 was around 46–47 years for males and 44–45 years for females. These estimates imply an average death rate of 18–19 per 1,000, an average birth rate of 40–41 per 1,000, a gross reproduction rate of 2.8, and a general fertility rate of around 192. Corresponding estimates for 1951–1961, based on the quasi-stable population model, give a life expectancy of 37–38, a death rate of 26, and a birth rate of around 45, although the census actuary placed these values at 40–41, 23, and 42, respectively. Public health programs and efforts to control malaria and other diseases evidently contributed to an improvement in life expectancy at an annual average rate of around 0.8 years between 1956 and 1966.

A decline of about 3–5 points in the birth rate between 1951–1961 and 1961–1971 is suggested by the various estimates mentioned above. About 20–30 percent of the decline is the result of changes in the age and marital-status composition of the population. The rest can be attributed to real changes in marital fertility. One set of estimates shows a decline in the Indian crude birth rate from 43.3 in 1956 to 40.4 in 1966 (about 6.7 percent over the decade) and further to 38.6 in 1971 (about 4.5 percent over five years). The expected acceleration of the rate of fertility decline since about 1966, the year in which the family planning program began to be pursued with some vigor, has not been realized.

Undoubtedly, there are parts of India with clear indications of a significant fertility decline. In Kerala, according to SRS data, the rural birth rate has declined from more than 37 in 1966 to 25 in 1978. Independent evidence of a decline in fertility is available in the reduced growth rate of enrollments in the first year of primary school—from 4.0 percent during 1961/62–1965/66 to 1.6 percent during 1965/66–1971/72. In Punjab, the SRS birth rate increased from about 33.6 in 1968 to 35.8 in 1972. This was followed by a decline in the birth rate to 32 in 1976 and 28 in 1978. The SRS estimate of the rate of natural increase in Punjab has been confirmed by the rate of intercensal population growth between 1971 and 1981.

For a society not widely practicing contraception, the Indian fertility level is low. The average birth interval is reported to be thirty to thirty-six months. Explanatory factors include (1) the custom of prolonged and almost universal lactation, which lengthens the duration of postpartum amenorrhea; (2) the physical separation of spouses indicated by sex-selective migration; and (3) low coital frequency and a fairly large number of days of abstinence, prescribed on religious grounds. A further decline in maternal mortality, a decline in the proportion of widows, or changes in lactation and abstinence prac-

TABLE 2. *Birth and death rates in India, according to the Sample Registration System*[1]

Year	Crude birth rate	Crude death rate	Rate of natural increase
1970	36.8	15.7	21.1
1971	36.9	14.9	22.0
1972	36.6	16.9	19.7
1973	34.6	15.5	19.1
1974	34.5	14.5	20.0
1975	35.2	15.9	19.3
1976	34.4	15.0	19.4
1977	32.9	14.7	18.2
1978	33.2	14.2	19.0

[1]Estimates exclude Bihar and West Bengal, together accounting for 18.4 percent of the total population enumerated by the 1971 census.
Source of data: India, Office of the Registrar General, 1980.

tices would all tend to increase the level of fertility unless the effects of such changes were at least counterbalanced by conscious adoption of contraception.

Migration. International migration to or from India is insignificant relative to the size of the population. India has open borders with Nepal and Bhutan to the north, but the major international migration has been from Pakistan in the west and what is now Bangladesh in the east.

There has been a sizable emigration of Indians to the United Kingdom, countries in the Middle East, Canada, and the United States since 1950. At the end of 1968, the number of Indian nationals living abroad was officially estimated at 600,000; over the next twelve years, the number reached 2 million. In parts of Kerala and Punjab, almost every household is reported to have at least one member employed abroad.

Internal migration, which can be an important avenue of exposure to modern influences, is generally regarded to be small in India. This impression is valid with respect to interstate migration. Persons enumerated in a state different from the one in which they were born, often termed "lifetime migrants," were only 3.0 percent of the total population in 1951, 3.4 percent in 1961, and 3.3 percent in 1971. However, nearly 39 percent of the people resident in urban areas at the time of the 1971 census had been born elsewhere. As might be expected, nearly 31 percent of these migrants had moved only a short distance (within the district); but the remainder, who had moved across district or state lines, numbered no fewer than 25 million.

Family Planning. India in 1952 was the first developing country to adopt a national policy of promoting family limitation. Table 3 summarizes the annual performance of the Indian family planning program in terms of acceptors of each method. The growth of public-sector budgets for the family planning program is summarized in Table 4.

While reviewing the data presented in these tables, one should note that the decision to launch a family planning program was undertaken in the early 1950s when the past recorded population growth had not exceeded 1.3 percent per year. The initial population projections by planners had essentially extrapolated the previous

TABLE 3. *Number of family planning acceptors by method and year of acceptance; 1956–1979/80 (in thousands)[1]*

Year	Sterilizations	IUD insertions	Conventional contraceptives[2]	Total acceptors	Equivalent sterilizations[3]
1956	7			7	7
1957	14			14	14
1958	25			25	25
1959	42			42	42
1960	64			64	64
1961	105			105	105
1962	158			158	158
1963	170		298	468	187
1964	270		439	708	294
Jan. 1965–March 1966	671	813	582	2,066	974
1966/67	887	910	465	2,262	1,216
1967/68	1,840	669	475	2,984	2,089
1968/69	1,665	479	961	3,104	1,878
1969/70	1,422	459	1,509	3,390	1,659
1970/71	1,330	476	1,962	3,768	1,598
1971/72	2,187	488	2,354	5,029	2,481
1972/73	3,122	355	2,398	5,874	3,373
1973/74	942	372	3,010	4,324	1,233
1974/75	1,354	433	2,521	4,307	1,638
1975/76	2,669	607	3,528	6,803	3,069
1976/77	8,261	580	3,692	12,534	8,663
1977/78	949	326	3,253	4,528	1,242
1978/79	1,484	552	3,469	5,505	1,865
1979/80	1,773	634	3,036	5,443	2,158

[1] Numbers of acceptors by method may not add up to totals because of rounding. Numbers for 1979/80 are provisional.
[2] The numbers refer to the equivalent total couple-years of protection, estimated from the annual number of pieces of these methods distributed. The numbers from 1971/72 onward exclude Nirodh distributed free to vasectomy acceptors. Numbers from 1976/77 onward include pill users.
[3] Equivalent sterilizations have been calculated by adding the number of sterilizations, one-third of IUD insertions, one-ninth of equivalent pill users, and one-eighteenth of conventional contraceptive users.
Source of data: India, Ministry of Health and Family Welfare, 1980.

TABLE 4. *Budget outlay and actual expenditure on family planning; 1951–56 to 1978–83 under public sector*[1]

Five-year plan period	All developmental activities (in millions Rs.)	Family planning (in millions Rs.)	Family planning as % of total development outlays	Actual expenditure on family planning (in millions Rs.)
First, 1951–56	23,560	6.50	0.03	1.45
Second, 1956–61	48,000	49.70	0.10	21.56
Third, 1961–66	75,000	269.76	0.36	248.60
Annual, 1966–69	67,565	829.30	1.23	704.64
Fourth, 1969–74	159,020	3,150.00	1.98	2,844.30
Fifth, 1974–79	393,220	4,970.00	1.26	4,089.81*
Sixth, 1978–83[2]	693,800	7,650.00	1.10	2,260.58**
Sixth, 1980–85	975,000	10,100.00	1.04	———

[1]If allowance is made for the rise in prices, the annual public-sector expenditure on family planning during the Fifth Five-year Plan period remained at almost the same level as during the Fourth Plan period.
[2]Figures given in this row are based on a draft of the Five-year Plan prepared before the parliamentary elections held in January 1980. The new government reconstituted the Planning Commission and directed it to prepare a revised plan by December 1980. Revised figures are shown in the next row.
*Relating to four fiscal years, 1974–1978.   **Relating to two fiscal years, 1978–1980.
Sources of data. India, Ministry of Health and Family Welfare, 1980, p. 4. India, Ministry of Information and Broadcasting, 1974, pp. 158, 162, 164. India, Planning Commission, 1978, pp. 17, 18, 242; 1981, pp. 57–58.

growth rate; and there were no precedents to follow for the approach to be adopted in promoting family planning. The decade ending in 1961 was a period of groping, with an emphasis on informational and research activities. A modest beginning was also made to set up three hundred urban and two thousand rural clinics for family planning activities. The actual expenditures, however, remained below 50 percent of the relatively modest targets.

Results of the 1961 census confirmed the expectations of scholars, based on experience in Sri Lanka and elsewhere, about the likely acceleration of the rate of population growth. It was also recognized that "family planning clinics" could hardly be the vehicle for persuading predominantly illiterate millions of couples, residing in some 576,000 villages and preoccupied with the mundane chores of eking out a modest livelihood, to limit their family size. During the early 1960s, therefore, the policy makers resolved to adopt an extension approach to carry the message of family planning to the homes of individual couples through a large network of auxiliary nurse-midwives operating under the guidance of the doctors attached to the primary health centers, with one of these per 100,000 population. This network began to be set up essentially during 1965–1966, which is often considered the year of effective beginning of the Indian family planning program. A Department of Family Planning was set up within the Central Ministry of Health.

During 1965–1967, there was considerable optimism about the possible role of the intrauterine contraceptive device (IUD) in the Indian program. The program leadership advocated a "cafeteria approach" offering free choice to the individuals to adopt whichever method suited them. However, somewhat indiscriminate insertions of IUD's and the lack of follow-up to attend to the problems of acceptors led to widespread adverse rumors about their side effects.

Emphasis on sterilizations. A key feature of the Indian family planning program has been its emphasis on sterilizations, the method adopted by more than 84 percent of the 27 million couples who were currently protected against the risk of pregnancy in March 1980. Although it is a permanent method, aimed at limitation rather than spacing of children, it has been favored in the Indian program since the late 1950s because it is safe and does not require sustained motivation and careful recurrent use of contraceptives such as spermicides, barrier methods, or oral pills. The program has preferred vasectomy because of its relative simplicity and the fact that the men undergoing vasectomy do not require extended hospitalization or postoperative care and rest. To offset the cost of time lost from work, vasectomy acceptors were given a modest monetary compensation, which acted partly as an incentive. As early as 1959, the government of Madras (now Tamil Nadu) decided to make a cash grant of Rs 30 (U.S. $6.25) to every poor person with three living children who was sterilized in a government hospital in Madras city. In 1960, the government of Madras extended the cash grant for sterilization to the entire state. The role of incentive or compensation payments (in cash or kind or both) was raised in the mass vasectomy camps (which first began in Kerala) in the early 1970s and more generally after the Population Policy Statement of April 1976, when for about a year the

payment was made to vary inversely with the number of living children. In recognition of the widespread interest in female sterilization, the program has also offered facilities for free tubal ligations, but the compensation or incentive payment to women has generally been less than to men because medical and postoperative care costs associated with tubal ligations are higher than those for vasectomies. Over the years, the percentage of tubal ligations among all sterilizations has fluctuated, but their absolute number has shown a steady upward trend.

Targets. The post-1965 period has also been marked by frequent adoption of time-bound targets for the scale of program performance during each year and the crude birth rate to be attained some five or ten years hence. While some targets may be useful or even necessary for stimulating and evaluating performance among the large staff of nearly 75,000 auxiliary nurse-midwives, the use of uniform criteria for setting targets for workers in far-flung villages, encountering quite diverse situations, has been criticized.

The targets for crude birth rate reductions have repeatedly proven overambitious and have had to be relaxed frequently, with an adverse effect on their credibility.

Big push in 1976–1977. Impatience with the slow progress of the family planning program led to an unprecedented increase in the extent of political support from the top echelons of the central government during the period of "Emergency," declared in June 1975. In April 1976, the central government issued a "national population policy statement," which promised measures to raise the age at marriage, improve literacy and education among women, and enhance the nutritional status of all children. Monetary compensation was increased to individuals undergoing sterilization, and group incentives were to be introduced. Eight percent of the central government's total assistance for state plans was to be allotted on the basis of performance in the area of family planning. The 1971 population size was to be the basis for determining (1) the share of states in the resources allocated by the central government and (2) the representation of states in the lower House of Parliament.

During 1976–1977, higher incentive payments, together with varying pressures on the program's staff, as well as on the nonprogram employees of the state and central government, to attain specific targets (which were revised upward within the year) produced 8.2 million sterilizations. This raised the percentage of "protected" couples from 17.2 at the end of 1975–1976 to 23.9 in 1976–1977. Some state governments were more zealous than the central government, with their leaders talking of compulsory sterilization programs. The Maharashtra state legislature actually passed a bill in August 1976 to compel families to restrict family size, but the central government withheld its approval. The intensity of the family planning program, particularly the sterilization drive, became the focus of attack by opposition parties during the elections in March 1977; and with the defeat of the ruling party, the widely feared backlash occurred, leading to a sharp decline in program performance during 1977–1978. The program slowly recovered during the succeeding two years; and performance during 1979–1980 exceeded that during the pre-Emergency year 1974–1975.

Ancillary developments. India enacted a quite lenient law permitting abortion in 1971. Between April 1972 and March, 1980, some 1.6 million registered abortions were performed; and nonregistered abortions done by both medical and nonmedical personnel were thought to number from 2 to 4 million per year. The minimum legal age at marriage for girls, difficult to enforce because of poor age reporting and absence of a tradition of birth registrations, was raised from 15 to 18 in 1978.

The sale of condoms at subsidized prices through established channels of leading distributors of consumer goods, called the Nirodh Marketing Program, has been operative since 1968. A program to motivate women to adopt family planning during the postpartum period following a delivery or abortion was launched as early as 1969 and covered 524 medical institutions and hospitals at the district level by the end of 1979–1980. Oral pill distribution also began through paramedical staff at the primary health centers. An Intensive District Scheme was launched in 1969 to undertake special efforts to promote family planning in more populous districts but was abandoned as unsuccessful. A Multipurpose Workers Scheme was launched in 1974 to integrate activities to promote family planning with those related to maternal and child health, such as prenatal and postnatal care and immunizations of preschool children. As of 1 January 1981, the training program of Multipurpose Workers was completed in 210 districts and was in progress in an additional 144 districts. The scheme is expected to be implemented by March 1982. So far about 132,000 multipurpose workers have been trained. Several demonstration projects, aided by international agencies, have also been implemented. For example, in 1973, an experimental project jointly developed by the government of India and the World Bank was launched in the six districts of Uttar Pradesh and five districts of Karnataka to demonstrate the level of achievement possible (1) with the full complement of the standard government program and (2) with alternative supplementary facilities or approaches. Encouraged by the results of this project, the government of India has now launched similar projects in 45 selected districts of 12 states with the assistance of the World

Bank, the Overseas Development Agency of the British government, the United Nations Fund for Population Activities (UNFPA), the Danish International Development Agency (DANIDA), and the U.S. Agency for International Development (USAID).

While the progress of various special schemes has been slower than expected or desired, and several new initiatives have been considerably delayed, there are few things that the Indian family planning program has not tried.

Interstate variations in program performance. There are sizable interstate variations in program achievements, as seen in Table 1 in the column showing the percentage of effectively protected couples. Pondicherry, Delhi (capital area), Maharahstra, and Gujarat, accounting for almost 15 percent of all eligible couples in India, have more than 30 percent of them effectively protected; Andhra Pradesh, Haryana, Kerala, and Tamil Nadu follow closely with an effective practice rate of 27 to 30 percent. However, in the two largest states of Bihar and Uttar Pradesh, and in Rajasthan, which account together for almost one-third (32.8 percent) of all eligible couples in the country, only 12 to 13 percent practiced contraception. An improvement in the family planning program performance in these states will be crucial for achieving a marked acceleration in the rate of fertility decline.

Assessment. Overall, the Indian performance in promoting family planning is quite remarkable in view of the low levels of literacy and education, relatively high infant and child mortality, and slow growth of per capita income over the past thirty years. Virtually every couple in India today knows about the possibility of limiting family size, at least through sterilization, which is a significant improvement over the situation prevailing in 1965 (although one may lament the overemphasis on the limitation rather than the planning of family size). While the effective contraceptive practice rate of about 23 percent includes the impact of the overenthusiastic drive of the Emergency period, it seems quite an achievement. However, relative to the targets adopted by the government and what the planning authorities might consider to be necessary for rapid socioeconomic development, the program has failed to meet expectations.

To view the Indian family planning program in perspective, one must recognize some critical features of the Indian situation. First, except for China, no other country has the population size and the heterogeneity of India. And India lacks the advantages of the tightly regulated or controlled society that has evolved in China over the past thirty years. However, even if the claims about the decline in the Chinese birth rate were found to stand up to rigorous statistical assessment, it is not clear that the sociopolitical conditions that have facilitated the Chinese achievements could or should be emulated in India.

Second, given the inadequate communication network and the rigid administrative organization, it is quite difficult to coordinate, monitor, evaluate, and provide logistical support to the nearly 100,000 persons employed in the Indian family planning program. The problems are not unique to this program; they are shared also by the agricultural extension program and the entire governmental machinery. However, the implications of adopting improved cultivation techniques or inputs may be manifest to the adopter within a short period, whereas the consequences of new behavior with respect to family size are difficult to comprehend for people who have not been trained to think in the abstract and whose environment is full of uncertainty about the risk of being left without any child.

Third, even with an improvement in program management, the literacy and education of the potential clientele would remain a major drag on progress toward lowering the rate of population growth. Despite impressive gains in school enrollment ratios over the past three decades, a large majority of the women in reproductive ages are illiterate. It is vital to reach them and their spouses through nonformal educational activities, which have hardly received the attention they deserve. In the long-run perspective, the children who will enter the reproductive ages over the next two decades must be the prime candidates for education about reproduction and family limitation. Through the activities of the National Council of Educational Research and Training, the main elements of population education have been introduced in the school curricula in most states. [*See* EDUCATION, *article on* POPULATION EDUCATION.] However, children who drop out of school before receiving the relevant instruction must be the target of special programs.

For the long-range programs to be successful, the political parties in India must evolve a consensus, so that the task of slowing the rate of population growth receives the priority it deserves. Such a consensus seems to have evolved recently after the publication of the 1981 census results. An Indian Association of Parliamentarians for Problems of Population and Development has been formed. The participants at a conference convened by the association in May 1981 have issued a New Delhi Declaration in which they have called for the appointment of a Population Commission.

The fruitless controversy about the relative contributions of the family planning program and of socioeconomic development to lower fertility must be avoided, so that sizable sections of the population do not continue to

hope for an improvement in their economic status through larger families, while the general situation deteriorates through increasingly severe competition for cultivable land, nonfarm jobs, and various ingredients of a better standard of living.

Given the momentum for population growth that is built into the young age structure of the Indian population, growth will continue for several decades to come. Even if the Indian fertility rate were to decline rapidly to a net reproduction rate of one by the year 2000 (instead of 1996 as was suggested in 1979 by the Working Group appointed by the Indian Planning Commission), the total population of the country in that year would probably approach one billion, nearly three times the 345 million in 1947 when the country won independence from British rule. There is unlikely to be a serious problem in feeding India's growing population; the rate of growth in food production has been higher than the rate of population growth and this trend is expected to continue. The monumental task of providing gainful employment to the growing labor force or ensuring an equitable distribution of purchasing power for the growing population, however, will put the Indian leadership to severe tests over the next two decades.

Scholarly Activities. Demographic research and population studies are well-established scholarly activities in India. The International Institute for Population Studies, Bombay, was founded in 1956 under the title of Demographic Training and Research Centre with the joint support of the government of India and the United Nations. It has trained a substantial number of demographers from India as well as from other countries of Asia. The Office of the Registrar General, which conducts the decennial censuses and coordinates the Sample Registration System, also undertakes applied research. It has sponsored a large number of village and town surveys. The Gandhigram Institute of Rural Health and Family Planning, located near Madurai in Tamil Nadu, has been active in training as well as in experimental research concerning the promotion of family planning in a rural setting. The Department of Family Planning in the Central Ministry of Health and Family Welfare supports the population research centers and communication action research centers in several states; these centers have the primary responsibility for evaluating the performance of family planning programs in the states and developing better approaches to the communication of ideas about regulating family size.

The National Institute of Health and Family Welfare in New Delhi is engaged in training and research activities relating to behavioral, demographic, and reproductive biology. It also seeks to coordinate the activities of the population research centers in the states. In 1971, some leading industrialists of India set up the Family Planning Foundation, which supports research in the social sciences as well as in reproductive biology.

The Indian Association for the Study of Population was formed in 1972. It grew to about 275 members by 1979 and publishes a quarterly journal *Demography India.* Another quarterly, the *Journal of Family Welfare,* is published by the Family Planning Association of India.

Under the aegis of the India Population Project funded by the World Bank and the Swedish International Development Agency, population centers were set up in Karnataka (at Bangalore) and in Uttar Pradesh (at Lucknow). The Administrative Staff College at Hyderabad and the Indian Institute of Management at Ahmedabad have developed specialized units to serve as consultants to the two population centers with respect to the management aspects of the family planning program. In 1980, the two population centers became full-fledged institutions of their respective state governments.

Indian scientists have been active in the field of research in reproductive biology, and their contribution has been of major significance in the overall world research effort. As part of the World Health Organization's Expanded Program in Human Reproduction, four major research and training centers have been established in India. The Indian Council of Medical Research and the Central Council of Research in Indian Medicine and Homoeopathy coordinate the research in different institutions and centers. The research activities are concentrated on applied and basic research on human reproduction, the development of better methods of contraception, and an improvement in the available methods.

<div align="right">Pravin Visaria
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See also ASIA; BANGLADESH; PAKISTAN; FAMILY PLANNING PROGRAMS, *article on* DEVELOPING COUNTRIES; LAW AND FERTILITY REGULATION, *article on* WORLDWIDE PERSPECTIVES.

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INDIRECT ESTIMATION OF FERTILITY AND MORTALITY

The demographic study of human populations very often involves the measurement of parameters that describe their patterns of growth. The definitions of the most commonly used parameters, such as the birth rate, total fertility, or infant mortality, are well known. The techniques used to compute them when the necessary data are both available and reliable are well developed, and they constitute the core of demographic estimation. In fact, up to the middle of the twentieth century, they constituted the only type of demographic estimation available. It was the realization that not all demographic data are reliable and the need to deal with lack of appropriate information that led to the development of another type of technique. The adjective "indirect" is applied to these techniques to distinguish them from those that assume the reliability of all the basic data and to indicate that they very often attempt to infer the value of a certain parameter from data that are only "indirectly" related to such a value, but whose reliability is judged to be greater than that of the basic data, which often may not be available

anyway, that would allow direct calculation of the parameter.

The practice of indirect estimation is certainly older than its consistent theoretical development (Coale, 1979), but the latter can be traced only to the early sixties when the demographic model of a stable population was proposed as a basis for indirect estimation (United Nations, 1967). At about the same time a study of the demography of tropical Africa, where data have been traditionally poor and very often altogether lacking, led to the development of other techniques designed to estimate fertility and child mortality from information on children ever born, children surviving, and those born during a given year (Brass et al., 1968). The publication of the United Nations manual IV in 1967 may be said to mark the official birth of indirect estimation, and since then it has developed rapidly. At present a wide spectrum of indirect estimation techniques is available. A brief description of them will be given in the following sections.

Before proceeding, however, a word about the necessity and importance of indirect estimation is in order. As mentioned, indirect estimation grew out of the unavailability or flawed quality of data, especially for developing countries. The necessity of deriving meaningful demographic estimates for these countries led demographers to ask two questions. First, when the traditional types of data (obtained through censuses and vital registration systems) are lacking, can some other data, whose collection is not too involved or expensive, yield as much and, perhaps, better information? Second, by what means can traditional parameter values be derived either from this type of unorthodox data or from the traditional types when they are known to be deficient? It is important to realize that indirect estimation is intended to answer both of these questions, and hence it encompasses not only a set of techniques for data analysis, but also a set of guidelines for data collection. It is not surprising then that an integral part of indirect estimation is constituted by a set of "indirect" questions, that is, questions designed to gather the information on which indirect estimation techniques operate. These questions generally investigate facts that the respondent is likely to know and are intended to elicit as accurate a response as possible. Because the usefulness of the questions is very often first postulated on theoretical grounds, their actual form often evolves as they are tried in the field. Thus, for example, survey experience has shown that answers to a question such as "How many births did you have last year?" are frequently of poorer quality than those obtained by asking the date of a woman's most recent birth. Therefore, when the estimation of fertility is of interest, it is recommended that the latter question be used to gather information on the number of births occurring during

the year prior to the survey. Following guidelines such as this at the time the data are collected in order to ensure that the definitions used in gathering information are exactly those demanded by the indirect methods of analysis constitutes a first and essential step in the process of indirect estimation.

Yet, no matter how clearly the questions are phrased, or how carefully the data are gathered, errors still occur. It is therefore a relevant characteristic of indirect estimation that an attempt is made to take into account the most probable sources of error and to minimize their influence. This goal is usually achieved either by making use of demographic models or by making assumptions that are translatable into clear mathematical relationships. Such an approach represents simultaneously the greatest strength and perhaps the greatest potential weakness of indirect estimation. Strength because, by basing itself on models and plausible hypotheses, the approach introduces some degree of order and consistency in what would otherwise be an amalgam of errors; weakness because, insofar as models and hypotheses do not reflect reality accurately, they become, themselves, sources of error. However, as the first two decades of the active practice of indirect estimation show, its strengths far outweigh its weaknesses; and in any event, the latter represent, rather than insurmountable drawbacks, challenges to be met with the development of better and more flexible models of demographic reality or with a deeper understanding of its dynamics.

Population Age Structure. Probably the most common type of data available for any population is its distribution by age and sex, since this distribution is one of the most important outputs of a population census. In many countries where vital registration is either nonexistent or very deficient, periodic censuses are the only source of relatively reliable demographic information. In others, although censuses have been far from periodic, the results of at least one or two are available for the latter half of the century. An age distribution represents a frozen record of the net effect of vital events (births, deaths, and migration) on the population, so in such cases, techniques that would allow the estimation of the usual demographic parameters from the information contained in a population's age distribution would be very useful. We shall briefly describe some such techniques in this section.

Stable population analysis. The concept of a stable population was first proposed by Alfred J. Lotka (Lotka and Sharpe, 1911), who proved that any population that is subject, for a sufficiently long time, to constant fertility and mortality acquires ultimately an unchanging age distribution that is independent of the initial age distribution and, therefore, is completely determined by the

fertility and mortality rates to which the population is subject. Lotka coined the term "stable population" for the end product of constant fertility and mortality conditions.

The stable population concept is relevant mainly for two reasons: first, it establishes a one-to-one correspondence between fertility and mortality on the one side, and age distributions on the other; and second, the correspondence is established in clear mathematical terms. Therefore, although the equations involved are not simple, in principle, if a given population can be assumed to be stable and two of the three elements, fertility, mortality, or age distribution, are known, the third can be uniquely identified.

This theoretical result provided the basis for the method of analysis proposed by Ansley J. Coale and Paul Demeny (United Nations, 1967). Two assumptions underlie this method, that the population studied is stable and that its mortality pattern is similar to one of the four patterns identified while studying a set of reliable life tables from a variety of countries (Coale and Demeny, 1966). Once a mortality pattern is selected, it is fairly straightforward to identify a model stable population that matches the age distribution and another demographic parameter (such as the growth rate, the birth rate, or the mortality rate over age 10) of the population under study. The process of estimation is then completed by accepting the parameter values of the selected stable population as estimates of the observed population's parameters.

The adequacy of these estimates depends on how well the assumptions underlying the technique are met. It is important, therefore, to assess the plausibility and possible limitations of these assumptions. We consider first the requirement that the pattern of the mortality schedule to which the observed population is subject be similar to one of the patterns embodied by the Regional Model Life Tables (Coale and Demeny, 1966). Although these models cover a fairly wide range of possibilities, it cannot be claimed that they cover the whole range of human experience. Furthermore, even when the mortality pattern of a certain population is adequately represented by some model, the task of identifying this model is generally complicated by the lack of reliable data. If data were perfect and the population were stable, the aim would be to obtain a perfect fit between a model and the observations. In this ideal situation any fit that is less than perfect would indicate that the model is inadequate. In reality, however, imperfect fits, the result mainly of errors in age reporting or of differential completeness of enumeration by age, are the rule. For example, the fact that for a given population the stable population identified by the growth rate and the proportion under age 5 is different

from the stable population identified by the growth rate and the proportion under age 45 is probably more indicative of differential omission of young children in the census count than of the inadequacy of the model used. One is then faced with a typical problem in indirect estimation: in stable population analysis some of the data's irregularities are smoothed by using models, but because of these irregularities the observed data are a weak basis for the selection of an appropriate model. Therefore, unless one can support one's choice of model with some type of independent, reliable evidence, the accuracy of the estimates obtained through the fit of a stable population will be somewhat uncertain.

As for the assumption of stability, it is likely to be violated in almost all instances, since most countries have experienced a decline in mortality during the past decades, and in a growing number of instances, a decline in fertility is also evident. The use of stable population analysis in a population that is not truly stable would produce biased estimates. Coale (1971) has proposed a method to correct these biases. It is based on the concept of "quasi-stability" (the state of a stable population that has been subject to declining mortality during the recent past), and it requires knowledge of both the current age structure of the population and the annual rate of change of the growth rate since the mortality decline started. The estimates yielded by this method are quite satisfactory, but their user must bear in mind that they are derived by assuming that the mortality change experienced by the observed population is linear with respect to time and that only the level of mortality is changing, not its pattern. The effects of mortality changes that do not happen so smoothly and regularly will not be reflected by the final estimates.

More recently, Coale has shown that stable population analysis can provide good estimates of the birth rate over the preceding fifteen years even in the face of changing fertility by fitting a stable population to the proportion of the population under 15 and an estimate of average child mortality over the period. Thus destabilization does not represent an unsurmountable objection to the use of stable population analysis.

Estimation of mortality from two successive censuses. Stable and quasi-stable techniques are similar in that they make use of the age distribution of the population at only one point in time. When censuses have been taken at periodic intervals, it is possible to use techniques that take into account the change of the population's age structure from one census to the next. Techniques based on intercensal comparisons are well known. In a closed population an intercensal life table from childhood onwards may be estimated "directly" by tracing birth cohorts from one census to the next. These estimates will be correct only if the population is truly closed, the two censuses have the same level of completeness, and there is no misreporting of age. In actual populations these assumptions very rarely hold simultaneously. Yet, by combining these ideas with the existing model life tables, Coale and Demeny (United Nations, 1967) devised a technique that attempts to identify the mortality level to which a population is subject on the basis of intercensal comparisons. This technique assumes that the pattern of mortality in the observed population conforms to one of the mortality patterns of the Regional Model Life Tables (Coale and Demeny, 1966). Once a pattern has been selected, the population enumerated at the first census is projected to the time of the second census (forward projection) by using probabilities of survival derived from model life tables. Trials are made using several mortality levels until, for each age x, the level that reproduces exactly the observed population over $x + t$ at the second census (t being the length of the intercensal interval) is identified. A representative mortality level is then selected among those estimated for the first nine or ten ages used (0, 5, 10, . . . , 40, 45). Cumulated age distributions (ages x and over) are used to minimize the effects of age reporting errors. The estimates yielded by this technique are generally acceptable, but they are very sensitive to differential completeness of enumeration between the censuses used. Unfortunately, the method itself does not provide any way of measuring this differential and correcting for it.

Another way of using intercensal comparisons to estimate mortality has been proposed by William Brass (1975), who suggests that the usual five-year probabilities of survival be estimated directly from data gathered by the two censuses and that child mortality estimates obtained independently be combined with these probabilities to estimate the life table $_5L_x$ values. The final mortality estimates are obtained by using the logit system to smooth the initial $_5L_x$ estimates. Since the logit system gives the user more flexibility in selecting an appropriate mortality pattern, this method may be preferred. However, just as in the Coale-Demeny version, the estimates it produces may be distorted by differential completeness of census enumeration; and, contrary to the method described above, this one does not incorporate any safeguard against possible misreporting of age.

The advantages of these methods are that they are not very sensitive to the choice of a mortality pattern and that neither requires the assumption of stability, being applicable therefore to any population that is effectively closed. Unfortunately, their sensitivity to differential census coverage and, to a lesser extent, to age-reporting errors frequently makes their use inappropriate.

Reverse projection methods. Another set of methods that make use of the population classified by age and that are not based on the assumption of stability are those that

allow the estimation of fertility parameters by reverse projecting the enumerated population. We shall discuss here two different variants of this general idea: the reverse projection method itself and the one known as the "own-children" method.

The usual reverse projection method is based on the fact that, in a closed population, the number of children under age x, say, enumerated at some point in time are just the survivors of births occurring during the x years preceding the time of enumeration. Hence, if the mortality rates to which infants and children are subject are known, the number of births can be inferred from the number of children. Straightforward applications of this method generally yield rather poor results, for two main reasons: the deficient enumeration or age recording of small children by censuses and the difficulty in estimating accurately the mortality to which young children are subject. It is by minimizing the latter source of error that indirect estimation may enhance the performance of reverse projection, but, unfortunately, little can be done to eliminate the former. At most, one can recommend that very young children not be considered and that attention be focused on the 1–4 or even 2–4 age groups, both of which are more likely to be complete than the 0–1 group. Probably the most important function of estimates obtained by this method is that of providing independent evidence to help in the assessment of estimates obtained by other means, especially when there are sound bases for deciding whether the reverse projection estimate of the birth rate derived from a given age group is an overestimate or an underestimate.

A method akin to reverse projection that shares therefore some of its problems is the "own-children" method first proposed by Lee-Jay Cho (1973). This method consists in linking, on the basis of answers to a question on relationship to the head of household, the children enumerated to their respective mothers. Once the linkage is achieved, the estimation of fertility is carried out by reverse projecting both the children to the time of their birth and the female population to each of the ten or fifteen years preceding the census. In this way one reconstructs not only the births that occurred in previous years, but also the female population that bore them. Furthermore, the child-mother linkage allows the classification of children by single years of age (both of mother and of child) at the time of enumeration, so that the mother's age at the time of the birth can be calculated. Therefore, if children are reverse projected not by age group as in simple reverse projection, but rather in cells defined by their age and the age of their mother, age-specific fertility rates may be estimated for each of the ten or fifteen years preceding the time of enumeration. These estimates, however, are usually not smooth because, just as in simple reverse projection, they are derived essen-

tially from enumerated children classified by single years of age, so that differential completeness of enumeration, age misreporting, and age heaping will affect them substantially. Hence, it is not unusual to find that the fertility rates estimated for the year immediately preceding the time of enumeration are too low or that those obtained from children aged 5 to 10 are too high. Averaging the results that refer to contiguous age groups is a way of reducing age-heaping effects.

The own-children method is attractive because it permits the detailed estimation of fertility from data that are very often collected by censuses, because it does not depend on any assumptions about fertility and because it is not very sensitive to assumptions about recent changes in the level of mortality. Clearly, however, it requires detailed estimates of mortality for both children and females, referring at least to the decade preceding the time of enumeration. If only one set of mortality rates is used in reverse projecting the population, mortality is implicitly assumed to have remained constant during the period considered. Yet, the method itself does not require such an assumption, and one is free to use different mortality schedules for different periods when evidence of changes in mortality exists.

The own-children method is also appealing because, in principle, it is capable of estimating fertility at different points in time and, thus, of estimating trends as well as levels. The existence of age heaping and differential completeness of enumeration, however, can frustrate these hopes. For instance, given the known deficiencies of census enumerations, it would be naive to interpret the drop in fertility rates during the two or three years immediately preceding the census as a true indication of the occurrence of a fertility decline. Such a spurious trend is more likely to be caused by the undercount of young children.

In practical applications the own-children method provides a fairly good estimate of overall fertility level (especially when only the estimates derived from enumerated children above age 3 are considered) and a rough idea of trends. In populations where age reporting is accurate (those of Chinese origin, for example) it performs remarkably well. In most instances the estimates it yields tend to be affected by what is known as "the grandmother effect" caused by the erroneous allocation of children to their grandmothers. This type of error could probably be eliminated by modifying the way data are collected because, although the way in which the proponents of the own-children method manage to match mothers with their children on the basis of age and relationship to the head of the household is very ingenious, it is hardly foolproof (especially when all the possible relationships have been coded only as three or four types). Matching would certainly be simpler, more accurate and

probably cheaper, if it were performed at the time the data are gathered by adding the mother's code to the record of every one of her children whenever they are found in the same household. This scheme is equivalent to adding a question on identification of mother for each child. Surveys that have incorporated such a question have indeed produced cleaner data for the application of the own-children method. Besides, such a scheme would entirely eliminate the most difficult step in applying the own-children method, the linking process.

Fertility. In the previous section two methods that allow the indirect estimation of fertility on the basis of observed age distributions were described. We shall now focus our attention on other methods of fertility estimation characterized by using data on children ever born. Information on parity (the average number of children ever born) is essential for these methods. This information is frequently collected by censuses and demographic surveys. Given its relevance in indirect estimation, it is important to ensure that it is reported according to the demographic definition of "parity," which refers only to pregnancies that result in live births. Therefore, the question formulated to collect information about a woman's parity must make absolutely clear that only live births are to be reported.

In theory, parity information provides a good measure of cohort fertility. In practice, however, demographers have long known that it is a rather poor measure, for, even in countries where the existence of an increasing trend in fertility is very unlikely, reported parities often fail to increase or even decrease with age. Several explanations for this phenomenon have been proposed. Two often quoted are the tendency of respondents to omit births of children who died young and their tendency to report only those children who are still at home. Errors of this type may be minimized if the global question on parity ("How many children have you ever had who were born alive?") is replaced by three separate questions. "How many children have you ever had who were born alive and who died later?" "How many did you have who still live with you?" "How many live elsewhere?" Although data collected by means of these three questions are better than those yielded by the global question, their deficiencies are not entirely eliminated.

Because parity information is deficient and because it cannot be easily translated into a period measure, such as a birth rate, another type of information has been gathered, namely, the number of births occurring in a given year. The first question used for this purpose was "How many children have you had during the last year?" The results it yielded were disappointing; in some instances the number of births reported seemed to be too high, in others it was too low. The problem appears to lie in the

fact that different persons interpret the period "year" in different ways, but only rarely does it mean exactly the 365 days preceding the interview to every respondent. The effects of this phenomenon, known as "reference-period error," can be minimized by specifying as clearly as possible the period of interest or, especially in societies where birth dates are important, by asking the date of the most recent event.

On the basis of these facts, Brass (1964) proposed a method that, by exploiting the strengths of each piece of information, manages to correct their deficiencies. The Brass, or P/F ratio, method of fertility estimation is based on a few simple premises: first, the births reported as occurring in a given year refer, in fact, to a period different from a year, whose length, however, does not depend on the age of the woman whose experience is being reported; second, the parity of young women is more likely to be reported accurately. Therefore, if fertility has been constant, parity-equivalent estimates (F) derived from the information on births occurring in a year to younger women (20–24 or 25–29) can be compared to reported parities (P) and an adjustment factor for current fertility (age-specific fertility rates estimated from births in a year whose shape, according to the first premise, is right) can be estimated.

This method was the first to combine in a meaningful fashion cohort experience (average parities) with period experience (current fertility) in order to assess their mutual consistency and adjust the one on the basis of the other. Although at present there are several other methods that allow the estimation of fertility in different circumstances, they all share the same general strategy: the comparison of some type of cohort measure with a period measure, in order to check their consistency and arrive at a satisfactory adjustment for the period measure.

In the following paragraphs we shall describe briefly some of the methods now available, state the assumptions on which they are based, and explain their limitations.

Brass-type P/F ratio methods. The first Brass method was described in detail above. It is based on three assumptions: fertility has remained constant during at least the fifteen or twenty years preceding the survey, the parities reported by young women are accurate, and the reference-period error affects the level of current fertility but not its shape. The original method Brass proposed used data classified by age and information on all births occurring during a given year. Variations in the type of data used have led to new versions of essentially the same method. Two variations are worth mentioning. First, instead of using data classified by age, data can be classified by duration of marriage. Because the time elapsed since first marriage is a better measure of time of exposure to the risk of conception than age, this version may

yield more satisfactory results than the age version in countries where marriage duration is reported with relative accuracy. Furthermore, when age at marriage has been changing, use of the age version is not appropriate because overall fertility is likely to have changed. Marital fertility, on the other hand, may be less affected and the duration method can be tried. Finally, it must be noted that the method assumes that marriage duration is measured as the time elapsed since a woman's *first* marriage. Unfortunately, this is not the standard definition used when investigating this item in censuses or surveys.

The second version of the Brass method estimates an adjustment factor for first births rather than for all births (Brass, 1975). The data this version requires are the proportions of women who have had at least one child (equivalent to first-order parities) and the first births occurring in a given year. These data may be classified either by age or by duration of marriage. In either case, an adjustment factor for current first-birth fertility is estimated under the assumption that this type of fertility has remained constant in the recent past. Although the estimated adjustment factor for first births does not solve the problem of estimating the true fertility level for all births, it does provide a consistency check for the all-births method because it is unlikely that first births will be less accurately reported than all births. Hence, the adjustment factor obtained on the basis of first births can be viewed as a lower bound for the adjustment of all births. The first-birth method is particularly useful in instances where one suspects that a decline in fertility has been brought about by the adoption of contraception to limit family size rather than by changes in the timing of first births.

Estimates based on the experience of hypothetical cohorts. In many countries, parity information has been gathered by several censuses or surveys, but no suitable period data are available to carry out Brass-type consistency checks. However, the availability of parity information for more than one point in time may allow the identification of female cohorts and the estimation of the increments their average parities have experienced during a given intersurvey period. Carmen Arretx (1973) has proposed a procedure that allows the estimation of intersurvey fertility on the basis of the observed parity increments for cohorts. This procedure consists of the calculation of average parities for a hypothetical cohort of women. Given the usual deficiencies of parity information, the raw, intersurvey, average parities being often too low, especially at older ages, Arretx suggests adjusting them by fitting a Brass fertility polynomial to values for younger women.

The consideration of fertility measures based on intercensal parity changes is interesting because it supplies a means of dealing with the problem of changing fertility. Indeed, the estimated intersurvey parities for a hypothetical cohort incorporate the effects of any fertility change that might have taken place and serve as a good summary measure of true cohort experience during the intersurvey period. Unfortunately, they are also likely to be affected by any errors present in the observed parities, especially when these errors are different from one survey to the next. For this reason, the use of intersurvey estimates for hypothetical cohorts is a valuable tool in detecting errors, since fairly small changes in completeness of parity reporting between surveys often give rise to intersurvey parities that are clearly unacceptable.

Child Mortality. Probably the most successful single set of indirect techniques now available consists of those that aim at estimating the levels of child mortality by using information on the proportion of children surviving among those ever borne by women classified according to either their age or their marriage duration.

Brass-type methods. The basic idea underlying most of these techniques was first proposed by Brass (1964). His original method is based on the fact that the proportion of children dead (Q) reported by women in a certain age group can be expressed as

$$Q = \int_0^\alpha c(x)q(x)dx, \tag{1}$$

where $c(x)$ is the proportion of children born x years ago to reporting women, $q(x)$ is the probability of dying between birth and age x, and α is the number of years between the birth of the first child of reporting women and the time of the survey. Since one can assume Q known when the appropriate information is gathered, two unknowns remain in this equation: $c(x)$ and $q(x)$. Brass suggested a way of inferring the shape of the fertility schedule from the comparison of parities reported by young women in contiguous five-year age groups and from knowledge of the mean age of childbearing. Using simulation, he proposed a means of transforming this information into adjustment multipliers that allow the conversion of the observed Q's into estimates of $q(x)$ for selected x values.

Equation (1) follows from the implicit assumption that mortality has remained constant during the years preceding the survey. In simulating the cases from which the multipliers allowing the estimation of $q(x)$ were inferred, Brass also assumed that fertility had remained constant and used a polynomial model to generate the necessary fertility schedules. Mortality schedules were simulated on the basis of the logit system generated by the General Standard (Brass, 1971). Since it was felt that these cases represented a rather narrow part of possible reality, the

Brass method was modified by estimating multipliers on the basis of a wider range of simulated cases. The first attempt in this direction was made by Jeremiah M. Sullivan (1972), who used data generated from observed fertility schedules and from the Regional Model Life Tables (Coale and Demeny, 1966). T. James Trussell (1975) carried out a second generalization by simulating data on the basis of the Coale-Trussell (1974) fertility models and the Regional Model Life Tables. Both the Sullivan and Trussell multipliers are obtained via regression equations whose independent variables are ratios of contiguous parities. These multipliers vary according to the regional pattern of mortality used in estimating them, and different sets are available for data classified by age and for those classified by marriage duration.

All the sets of multipliers estimated to date produce satisfactory estimates of child mortality whenever the assumptions upon which they were calculated are met, namely that fertility and mortality be constant during the years preceding the survey and that the structure of the fertility and mortality schedules used in simulating the cases on which the multipliers are based be similar to those experienced by the observed population.

Of these two assumptions, the first is probably the most restrictive since in many countries neither mortality nor fertility has remained constant in the recent past. Therefore, methods based on more realistic assumptions were needed.

Feeney-type methods. Griffith Feeney (1980) was the first to propose a method based explicitly on the assumption of declining mortality. Specifically, he assumed that period mortality in a population is adequately represented by a one-parameter system of model life tables indexed by infant mortality. A mortality decline is then expressed in terms of a linear decline of infant mortality at a constant annual rate. Feeney's estimation procedure is based on a generalization of equation (1), namely

$$Q = \int_0^\alpha c(x)q(x; w, r)\, dx, \tag{2}$$

where Q, α, and $c(x)$ are defined as before, and $q(x; w, r)$ is the probability of dying between birth and exact age x when infant mortality has been declining linearly at a constant annual rate r, reaching the value w at the time of the survey (Feeney, 1980). This equation contains essentially three unknown parameters, $c(x)$, w, and r, given the assumption of a fixed mortality pattern for $q(x)$. Feeney estimated $c(x)$ on the basis of the mean age of childbearing and the Brass fertility polynomial, and he showed empirically that for a given Q, any two of the linear trends determined by different pairs of w and r satisfying equation (2) intersect approximately at the

same point. The coordinates of this common point of intersection determine Feeney's estimate of infant mortality and the time to which it refers. Following the same procedure for every Q, one can estimate a series of dated infant mortality rates for the ten or fifteen years preceding the survey.

Feeney's method, although more general than those assuming unchanging rates, still has some limitations. First, since it assumes a constant mortality pattern, the estimates it produces will be highly dependent on the pattern used, especially because of its emphasis on infant mortality, a parameter that changes considerably from one pattern to another. Second, although in theory its users can select any pattern judged appropriate, in practice the estimation equations presented by Feeney (1980) are based on the Brass General Standard. Finally, the estimates it produces will be biased to the extent to which the change in mortality experienced by a given population is not consistent with a linear trend in infant mortality.

Coale and Trussell (1977) have proposed a technique that reduces the first two limitations mentioned above. This technique allows the estimation of the time $t(x)$ before the survey to which the different $q(x)$ estimates derived from the usual Trussell multipliers refer. Since these $t(x)$ estimates are also obtained by assuming that the pattern of mortality is fixed, dated estimates of infant mortality ($q(1)$) consistent with such a pattern and with the estimated $q(x)$ values can be calculated (by interpolating within the appropriate tables). Therefore, this technique can potentially produce estimates equivalent to those yielded by Feeney's method, while adding the flexibility of more patterns to choose from. However, this method also assumes that changes in mortality are linear. Specifically, it is based on data generated by assuming that each $q(x)$ declines linearly with time, at an annual rate of 0.03, and therefore, just as in Feeney's method, the estimated $t(x)$ values may not have any clear meaning when true changes in mortality have not followed such smooth trends.

Alberto Palloni (1979a, 1979b) has devised and applied several procedures based on different hypotheses regarding the type of mortality decline experienced by a population. Two of these procedures are worth mentioning: the first assumes that the decline occurs linearly across cohorts (and not across periods as assumed by Feeney or by Coale and Trussell), and the second incorporates a nonlinear trend of decline across periods. The latter is interesting because it may approximate true trends more closely. Yet, Palloni himself comments that it may not be easy to detect if it is appropriate in a given situation because of the intrinsic paucity of the data used (only seven distinct points corresponding to the usual seven age

groups of mother are available at any given point in time).

Finally, this discussion would not be complete without mentioning the elegant work of Sullivan and Godwin A. Udofia (1979), who present in a very clear and concise fashion the theory underlying all these methods.

The Preston-Palloni method. Samuel H. Preston and Palloni (1977) have proposed a method that allows the estimation of child mortality from data on children surviving classified according to their own age and that of their respective mothers. In fact, this method is based on exactly the same data required for the application of the own-children method, and hence all comments made earlier about these data are also pertinent to this situation.

Preston and Palloni remark that the age distribution of surviving children maps out the fertility history of reporting women, so that the fertility terms appearing in equation (1), used by Brass, need no longer be estimated by means of models. For this reason, the method they propose is, in theory, well suited to estimate child mortality in instances where fertility is changing rapidly or for population subgroups whose fertility patterns deviate from the overall mean. The authors also show how the age distribution of surviving children, whose mother's age at the time of the survey falls within a given interval, can be used to determine the age x for which the estimated $q(x)$ is independent of the choice of model pattern used in deriving the estimate, provided the true mortality pattern is related to the model used in a way similar to that observed among the four regional mortality patterns (North, South, East, and West) of the Coale-Demeny (1966) model life tables. After analyzing the ages x determined by these regional patterns, the authors conclude that for the set of ages x the Brass-type methods use, the West regional pattern provides, on average, the best $q(x)$ estimates for women in the age range 20 to 39.

Although in most of their discussion the authors assume that the population has been subject to an unchanging level of mortality, they also discuss a variant of their method that can be used when mortality has been declining linearly in the $q(a)$ values of different cohorts.

In theory, therefore, the Preston-Palloni method provides one of the most complete approaches developed so far to estimate child mortality. However, its performance in practice needs to be tested further, especially because age misreporting and age heaping among children, differential undercounts by age, mismatches of children and mothers, and the existence of net child migration from the household are all likely causes of errors in the final estimates.

We conclude this section by noting that, although the methods to estimate child mortality from information that is fairly reliable and easy to gather are relatively well developed, most of them still incorporate assumptions that are not likely to hold in practice (such as the maintenance of a linear trend of decline in the $q(a)$ values during some fifteen or twenty years), and they totally disregard some aspects of the dynamics of child mortality (such as its variations with parity or with mother's age). Whether greater realism in their premises can be achieved without requiring the availability of more or better information remains to be seen, but in the meantime the methods give results that are apparently satisfactory.

Adult Mortality. At least four different types of methods allowing the estimation of adult mortality are now available. Two of them are based on the collection of new types of data, concerning the survival of parents and the survival of spouses. The two others are aimed at exploiting the characteristics of the typical data sources, censuses and vital registration systems, in order to detect and, if possible, minimize the deficiencies of the data.

Orphanhood information. The estimation of demographic parameters from data that are only partly dependent upon their values is typical of indirect estimation. In this sense, the method that allows the estimation of survival probabilities from the observed proportions with a surviving mother or surviving father in a given population epitomizes this type of approach to demographic estimation.

This method was proposed by Brass and Kenneth Hill (1973), who thought that the quality of responses to a question such as "Is your mother alive?" would be better than that achieved by inquiring about the number of deaths occurring during a given period. They also proposed that the survival of fathers be investigated, but experience has proved that survival probabilities for males estimated on the basis of this information are not so reliable as those for females, mainly because of the difficulty in making an accurate model for male fertility. Indeed, since the number of orphans in a given population depends upon both the mortality rates experienced by their parents and the probabilities of being born and surviving of the interviewed, it is the joint fertility and mortality experience of the population that determines them. Therefore, in developing a workable procedure for estimating adult mortality, assumptions have to be made about the type of fertility and mortality conditions underlying the process. All the variations of this method (Hill and Trussell, 1977) available to date assume that fertility and mortality have remained constant for a long time (forty or fifty years) and that the survival of parents is independent from that of their children. Cases simulated in accordance with these assumptions and via model fertility and mortality schedules provide the basis for deriving appropriate estimation equations. Variations

arise as a result of the use of different models in generating the simulated cases or of different independent variables in determining the final estimation equations.

The orphanhood method produces apparently reasonable estimates of female survival probabilities on the basis of information on the survival of mothers of respondents who are at least 20 years of age. Data for respondents whose age is below 20 cannot be used in practice because of what may be called an "adoption effect": too few young respondents report a dead mother, probably because they may have been adopted, and report the survival of their adoptive mother.

Finally, we must point out that this method only estimates the mortality of parents and that its results may be biased if the number of surviving children and the probability of survival of the mother (or father) are not independent.

Widowhood information. The same type of reasoning that led to estimating adult mortality from information on orphanhood led to an attempt to estimate adult mortality from information on the widowhood status of respondents. Hill (1977) proposed an estimation procedure derived from cases simulated by assuming constant mortality and nuptiality conditions and no remarriage. He suggested that the effects of remarriage can be eliminated by asking about the survival status of the first husband (or wife) of the respondent, rather than that of the most recent spouse.

Estimates of adult mortality based on widowhood information are likely to be better than those based on orphanhood because marriage occurs early and rapidly for both sexes, increasing the reliability of the estimation procedure to variations in mortality through time. Furthermore, data on widowhood of the first spouse are not likely to suffer from effects similar to the "adoption effect," so that reports from young respondents exposed mainly to recent mortality rates can be used. Finally, since in most developing countries marriage is nearly universal, the population to which the estimates refer is a close approximation of the total.

Widowhood data may be tabulated according to two different time measures: age and time elapsed since first marriage. When the latter is used, the estimation of mortality becomes simpler and more accurate because the time of exposure to the risk of dying can be estimated more precisely. This advantage may be lost, however, if the "duration of first marriage" measure is subject to greater reporting errors than age is.

In spite of its advantages, the widowhood method does not, in practice, estimate female adult mortality so well as the one based on maternal orphanhood. The most likely cause of its failure is the rather loose definition marriage has in some societies, especially in those where consensual unions are frequent. In these instances, of course, a wide definition of marriage should be used while gathering the data. When this guideline is followed, the widowhood method has been quite successful in producing reliable estimates of adult mortality.

Growth-balance methods. The existence of some type of vital registration system in many developing countries and the realization that the data such systems produce are fairly deficient led demographers to develop procedures for detecting and, if possible, correcting these deficiencies.

Perhaps the best-known method of this type is that proposed by Brass (1975) for estimating the completeness of death registration (relative to the completeness of population enumeration) in countries with unchanging fertility and mortality (this method assumes the stability of the population). The basis of the estimation procedure proposed by Brass is the "growth-balance equation":

$$b(x+) = r(x+) + d(x+), \qquad (3)$$

according to which the birth rate over age x ($b(x+)$) in a stable population equals the growth rate over age x ($r(x+)$) plus the death rate over age x ($d(x+)$). When the population is stable, $r(x+)$ is constant for all x. Furthermore, if deaths are assumed to be equally underreported at all ages by a factor K, equation (3) becomes

$$b(x+) = r + d^*(x+)/K, \qquad (4)$$

where $d^*(x+)$ is the reported death rate over age x.

Therefore, r and $1/K$ can be estimated by fitting a straight line to the points defined by $d^*(x+)$ and $b(x+)$, whose values can be calculated from the reported number of deaths and the enumerated population, both classified by age.

The growth-balance method has been quite successful in providing estimates of death registration completeness, especially when only deaths over age 10 are considered (registration completeness is usually not constant with age, being much lower at younger ages). However, its results are fairly sensitive to age misreporting (especially when age is consistently overreported) and moderately sensitive to true instability.

Preston et al. (1980) have proposed another method to estimate K, also based on the assumption of stability and requiring knowledge of an estimate of the growth rate in addition to the deaths and population classified by age. The authors suggest several ways of assessing the validity of the final estimates. These diagnostic procedures are especially useful in situations where the assumptions do not hold or where errors render useless the straightforward Brass method.

The assumption of stability is not necessary when intercensal changes are considered. Preston and Hill

(1980) have developed a method to estimate the average completeness of death registration during an intercensal period and the completeness of the first census (both relative to the completeness of the second) by relating the registered number of deaths occurring in a given birth cohort to the number of deaths implied by the cohort's change in size during the intercensal period. This method, though certainly promising, is fairly sensitive to the existence of net migration and to changes in patterns of age reporting from one census to the next.

Conclusions. In previous sections some techniques whose use has become synonymous with the practice of indirect estimation were described concisely. Of the four areas covered (the use of age structures, the estimation of fertility, the estimation of child mortality, and the estimation of adult mortality), the third is probably the most highly developed to date, and it incorporates fairly solid and reliable techniques.

The area of fertility estimation is still in need of effective methods that are not restricted by assumptions of constant vital rates. Much effort is currently being devoted to the development of better and more realistic techniques in this area.

In the area of the estimation of adult mortality, the methods available, though strictly inadequate in terms of the assumptions they make, do provide fairly reliable estimates in a wide variety of settings. Of course, attempts are constantly being made to relax their assumptions or to reduce the effects that data errors may have on their performance. But these efforts have so far improved only modestly the performance of the original methods. Perhaps the most interesting development to expect in the near future is the possibility of dating the estimates derived from widowhood and orphanhood information.

The use of age-structure information in conjunction with stable and quasi-stable models is an approach that is rapidly becoming inadequate because of the changes in fertility experienced by a growing number of countries. The use of reverse-projection methods, however, is still promising, although enhancement of their performance is likely to come about mainly through better understanding of the causes and patterns of age misreporting and through improved data-gathering mechanisms (such as using the right question in the case of own children) rather than through the development of better analytical techniques.

To conclude this brief overview of a rather complex field, we must mention that the successful practice of indirect estimation depends on more than being able to apply accurately the techniques described in the literature. The analyst familiar with indirect estimation knows that no single method is likely to yield *the* answer. Every method will, however, disclose one more piece of evidence that the skillful analyst must judge and assess within a wider context. The aim is to achieve a consistent picture, and indirect estimation is just a means to this end, not the end itself.

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See also DATA COLLECTION, *article on* NATIONAL SYSTEMS; LIFE TABLES.

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INDONESIA

The world's fifth most populous nation, Indonesia is located astride the equator in Southeast Asia. It lies south of Malaysia, Singapore, and the Philippines, north of Australia, and west of Papua New Guinea. Its population of 147 million in October 1980 was very unevenly distributed, with about 62 percent living in Java, which constitutes less than 7 percent of the land area. Population growth is moderately rapid at a little over 2 percent per year, and Indonesia's population is almost certain to exceed 200 million by the year 2000.

Location and Description. Indonesia is an archipelago of five major islands (Sumatra, Java, Kalimantan, Sulawesi, and Irian Jaya) and thousands of smaller islands, stretching over 5,000 kilometers (3,100 miles). A chain of active volcanoes runs down the west side of Sumatra, through Java, Bali, and Nusatenggara and swings north through North Sulawesi and Halmahera to the Philippines. These volcanoes have brought fertile soils—and occasional disasters—to many of the areas within their reach. Volcanic areas tend to be densely populated, whereas the large swampy regions of parts of eastern Sumatra, southern Kalimantan, and southern Irian Jaya, along with mountainous interior areas of Kalimantan, Sulawesi, and Irian Jaya, tend to be sparsely settled. Parts of Indonesia were colonized by the Dutch for more than three hundred years, though other parts did not come under Dutch rule until the early twentieth century. In this as in other respects Indonesia is a complex country whose national motto, "Unity in Diversity," appropriately hints at the massive problems of welding together many ethnic groups with their own customs and languages. Bahasa Indonesia, the Indonesian language, is one unifying force. Islam claims the adherence of 87 percent of the population, though its degree of orthodoxy differs widely between and within regions. There are substantial Christian, Hindu, and Buddhist-Confucianist minorities.

Population Characteristics. Although Java contains the lion's share of Indonesia's population, the proportion living in Java is slowly decreasing, as a result both of a slower rate of natural increase and of net out-migration. The proportion living in Sulawesi is also declining, while that in Sumatra and Kalimantan is rising, the result both of a very high rate of natural increase and of net in-migration. The fastest-growing provinces between 1971 and 1980 were Lampung and East Kalimantan, each with an average annual growth rate of 5.8 percent. The capital city, Jakarta, with 6.5 million people in 1980, grew at only 3.9 percent.

The density figures shown in Table 1 are deceptive, because of wide variation between regions. For example, in Nusantenggara, densities range from 29 per square kilometer in East Timor to 408 in Bali, and at regency level the variations are wider still.

The 1971 census measured a total population of 119 million (see Table 2), composed of 24.3 million households and including 28.6 million women of reproductive age (15–49). It recorded a labor force of some 41.2 million, though this figure rises to 48.8 million if those are

TABLE 1. *Population of Indonesia, 1980*

	Area in sq km (thousands)	Population (thousands)	Average annual growth rate, 1971–80	Density (persons/ sq km)
Java	135	91,282	2.0	676
Sumatra	541	27,980	3.3	52
Kalimantan	551	6,721	2.9	12
Sulawesi	228	10,378	2.2	46
Nusatenggara (incl. Bali and East Timor)	93	8,469	2.3*	91
Maluku and Irian Jaya	497	2,553	2.7	5
INDONESIA	2,045	147,383	2.3	72

*East Timor excluded from the calculation.
Source of data: Preliminary figures, 1980 population census; author's calculations.

TABLE 2. *Selected demographic parameters for regions of Indonesia*

	Jakarta	West Java	Central Java	Jogja-karta	East Java	Total Java	Bali	Sumatra	Kalimantan	Sulawesi	Total Indonesia
1. Population 1961[a]	2,907	17,615	18,407	2,241	21,823	62,993	1,783	15,739	4,101	7,079	97,019
2. Population 1971	4,576	21,633	21,877	2,490	25,527	76,102	2,120	20,812	5,152	8,535	119,139
3. Population 1976	5,366	23,453	23,556	2,624	27,103	82,103	—[b]	23,510	5,866	9,380	131,324
4. Percentage increase in population, 1961–76	85	33	28	17	24	30	—	49	43	33	35
5. Persons per sq km, 1976	9,316	478	683	836	572	610	—	43	11	41	65
6. Total fertility rate, 1967–70	5.0	5.9	5.4	4.8	4.6	5.2	5.7	6.5	6.1	6.2	5.6
7. Total fertility rate, 1971–75	4.6	5.6	4.8	4.2	4.2	4.8	5.2	6.0	5.5	5.8	5.1
8. Total fertility rate, 1975	4.5	5.1	4.3	4.2	4.0	4.6[c]	4.9	—	—	—	4.9
9. Crude birthrate (per 1,000 population), 1967–70	43.1	47.5	43.3	35.5	40.2	43.2[c]	43.2	—	—	—	44.9
10. Crude birthrate (per 1,000 population), 1971–75	38.6	43.6	35.6	29.6	33.9	37.3[c]	37.6	—	—	—	38.9
11. Percentage of decline in CBR from 1967–70 to 1971–75 due to changes in											26
age structure	26	35	23	22	23	25[c]	17	—	—	—	36
marriage pattern	62	36	38	22	28	35[c]	27	—	—	—	33
marital fertility	12	29	39	56	49	40[c]	56	—	—	—	
12. Infant mortality rate (per 1,000 births), mid-1968	126	166	140	93	119	140	127	143	144	150	143
13. Infant mortality rate (per 1,000 births), late 1972	87	139	106	82	102	114	101	91	140	116	112

[a]Population figures in rows 1–3 in thousands. [b]Dashes indicate "not available." [c]Including Bali.
Sources of data: Rows 1 & 2: 1961 and 1971 population censuses. Row 3: Indonesia, 1978b. Rows 6 & 7: United States, 1980; the estimates shown are averages of rates derived from SUPAS I and SUPAS II using the own-children method. Row 8: T. H. Hull, unpublished report. Rows 9–13: United States, 1980.

added who were not in the labor force during the reference week but who worked in agriculture in the previous season. The ratio of dependent population to working population was 143:100 if this "expanded" estimate of the labor force is used, and 94 if measured by the ratio of the young and old population to the "potential" workforce (those aged 15–59). Neither measure is entirely appropriate in a country where family enterprise predominates, where the distinction between economically productive and nonproductive activities is blurred, and where children begin to work at quite a young age.

The major sources of population data in Indonesia in recent times are the 1930, 1961, and 1971 censuses and the 1976 Intercensal Survey (SUPAS). Preliminary results from the nationwide census conducted in 1980 were released just at the time of this writing. Important surveys of a less comprehensive nature than SUPAS have included the 1973 Fertility-Mortality Survey, the 1976 Indonesia Fertility Survey (restricted to Java and Bali), and the series of labor-force surveys beginning in 1976 (SAKERNAS). A registration system exists but has incomplete coverage in most areas. After efforts in the late 1970s to upgrade the system through the Sample Vital Registration Project, the Central Bureau of Statistics is attempting to achieve complete registration in Jakarta and East Java and is planning to achieve complete registration throughout Java.

Growth. Indonesia's population quadrupled between 1900 and 1980. Nor does rapid growth date only from the beginning of the twentieth century. The population of Java, in particular, used to be considered one of the most dramatic examples in the world of population growth attributable to establishment of peace and order under colonial rule, introduction of health services along with improvements in sanitation and hygiene, and improvements in levels of living; a sevenfold or eightfold increase during the nineteenth century was often mentioned. It is now apparent that this figure was exaggerated, as it was based on an estimate of Java's population in 1800 which was well below the actual. Nevertheless, Java's population probably nearly trebled during the nineteenth century and trebled again during the first eighty years of the twentieth century.

During the present century, population growth in the outer islands has been more rapid than in Java. Sumatra's population has increased five or six times during the past eighty years and is the same as that of Java only eighty years ago. Kalimantan and Sulawesi have also experienced rapid population growth.

Mortality and fertility. Following World War II, the decline in mortality characteristic of most developing countries has also occurred in Indonesia, though levels of mortality remain well above those in neighboring Ma-

laysia, the Philippines, and Thailand. The infant mortality rate has recently declined by about 4 percent per year, from a level of 150 or more per 1,000 live births around 1965 to about 110 in 1975. Although substantial regional and rural-urban variations in infant mortality exist, even greater differences are measured between different socioeconomic groups. Much less is known about levels and trends of mortality among adults, although the pattern of adult mortality appears to be one of relatively low mortality between ages 20 and 45 and relatively high mortality between ages 45 and 60 compared with standard life tables. Life tables constructed for 1973 after a careful evaluation of available data show an expectation of life at birth of 48 for Indonesian males and 50 for females.

In 1980 Indonesian fertility was moderately high, but it ranged widely from total fertility rates above 6 in Sumatra and 5 to 6 in Kalimantan and Sulawesi to slightly above 4 in Jogjakarta and East Java. The modest fertility characteristic of large areas of Java appeared to stem from a number of factors: relatively high levels of primary and secondary sterility, related to poor health and nutrition; long periods of breastfeeding and postpartum abstinence; and high levels of marital disruption resulting from both widowhood and divorce. In recent years, fertility has begun to decline in many parts of Indonesia. Although the evidence on the degree of decline is still rather tentative, total fertility rates have declined by something of the order of 10 percent between 1968 and 1975. It is clear that both a rise in age at marriage and declining marital fertility have contributed to this and that the decline has occurred both in areas covered by the national family planning program and those not covered. Evidence that use of contraceptives through the national family planning program was increasing rapidly in Java and Bali indicated that the decline in marital fertility was related to the increased practice of modern contraception. This is different from saying that the decline in fertility was attributable to the national family planning program. The causes of the decline were undoubtedly complex. Social and economic development are generally held to influence fertility, and surprise has often been expressed that fertility in Indonesia is declining despite lack of marked improvement in such indicators of social and economic development as per capita real income, literacy, and access to health services. However, major if diffuse social change was undoubtedly occurring, some of it related to the vastly increased penetration by the mass media and increased levels of schooling.

Migration. International migration has played only a minor role in Indonesian population growth, but internal migration has brought about some important shifts in the location of population. In the first three decades of

the twentieth century, there was substantial movement of Javanese to plantations in North Sumatra and Riau, and by the 1930s there was a small but growing movement to Lampung (in southern Sumatra) as a result of officially sponsored land-settlement schemes. Since World War II, patterns of movement have diversified considerably, with Lampung and the nation's capital, Jakarta, the major recipients, both in terms of absolute numbers of net in-migrants and relative to their population size. Provinces suffering the greatest relative population loss through migration have been Central Java and Jogjakarta, and to a lesser degree West Java. Efforts to step up numbers moved through the government-organized transmigra-tion program and to settle people in a greater number of areas should reinforce the trend toward greater complex-ity in population redistribution, as should continued mobility of such groups as the Minangkabau of West Sumatra and the Buginese and Makassarese of South Sulawesi, and development of areas such as the oil- and timber-rich province of East Kalimantan. Other note-worthy aspects of migration patterns are the age and sex selectivity of migrants, with a domination of males aged 20–29 and females aged 15–29 but an overall male domi-nance. There are important elements of circularity in Indonesian migration patterns, which are not fully cap-tured by census data.

Internal migration has contributed to the growth of some of Indonesia's cities, notably Jakarta but also such cities as Tanjung Karang, Pakanbaru, Samarinda, and Balikpapan. Migration (including children born to mi-grants after they moved) probably contributed slightly more than 50 percent of Jakarta's population growth in the 1961–1971 period. Although the cities mentioned all grew by more than 4 percent annually in the decade to 1971, many cities grew much more slowly, and some cit-ies in Java appeared to have experienced a net out-migration. Overall, the proportion living in urban areas in Indonesia increased only from 14.8 percent in 1961 to 17.4 percent in 1971, and 17.9 percent in 1976. The last figure may be on the low side because of the timing of the survey during one busy season in agriculture and failure to widen boundaries of some cities with urban "overspill" or to add newly growing towns.

The low level of urbanization is reflected in the high proportion of the employed population who work in ag-riculture; in 1971 this proportion was 75 percent, com-pared with only 6 percent in manufacturing. The propor-tion in agriculture was below 70 percent in 1976, though the figures for the two years are not directly comparable.

Education. Availability of schooling increased after independence, and in the 1950s and 1960s the proportion of children receiving primary and secondary schooling increased substantially. In 1976, 60 percent of children aged 5–13 were attending school, and 27 percent of chil-dren aged 14–19. Rapid improvement in provision of educational facilities is reflected in the fact that among the population aged 20–29, 20 percent had at least some high school education, whereas the comparable propor-tion among the population aged 50–59 was only 3 per-cent. Conversely, only 20 percent of the 20–29 year age group had never been to school, compared with 64 per-cent of the 50–59 year age group. The improvement in educational levels for females has been especially dra-matic, though they remain below those of males.

Population Policies and Action. Although by the early years of the twentieth century, the Dutch colonial gov-ernment had become concerned about population growth and its effects on welfare in Java, efforts to coun-teract growth were confined to schemes to resettle part of Java's population in the outer islands—first called "colo-nization" and later, "transmigration." Such schemes have remained an important element in official thinking on population policy to the present day, although at no stage in this century have they succeeded in removing more than a small fraction of the increment to Java's population.

Family planning. Contraception as another possible solution to population growth was opposed during the Sukarno era in the 1950s and early 1960s, though private efforts to promote family planning gradually developed and the Indonesian Planned Parenthood Association, formed in 1957, played a low-key role during the follow-ing two decades. The transfer of power to the regime of President Suharto in 1966 brought with it a change in basic thinking on population issues, and a clear official policy of lowering the birth rate was first enunciated by the president in 1967. In 1968 the National Family Plan-ning Institute was created, and in 1970 it was superseded by the more powerful National Family Planning Board (BKKBN), reporting directly to the president and fully responsible for all government family planning activities. The national family planning program began to be pro-moted vigorously from that date. At first it relied heavily on foreign funding, but by the mid-1970s the govern-ment budget covered more than half of total expendi-tures.

In 1974, the family planning program, promoted at first only in Java and Bali, was expanded to ten outer-island provinces and subsequently to all provinces. It was recognized that because of the shortage of clinics and medical personnel, a passive clinic-based program would not work. Instead, field-workers were appointed to moti-vate and recruit family planning "acceptors" and to dis-tribute contraceptives. In the early years, special drives were used as a mechanism for focusing attention and ef-fort on family planning. Subsequently, the Village Con-

traceptive Distribution Centres Programme, started in 1975, was successful in enlisting local volunteers to recruit and support acceptors and to distribute pills and condoms.

The achievements of the family planning program in Java and Bali within a few years exceeded most expectations. In East Java and Bali, the performance was dramatic. By the end of 1976, one-third of all "eligible" women (married women of reproductive age) were estimated to be currently using a contraceptive method supplied by the program. The comparable figure for all of Java and Bali was 23 percent. The validity of these estimates was supported by independent survey data. The coverage of the eligible population continued to expand, and by June 1979 the proportion of current users in Java and Bali had risen to 35 percent. Some outer-island areas, where the program had a shorter history, were also doing well. In June 1979, 23 percent of eligible women in North Sulawesi were estimated to be using program methods, and in South Kalimantan 13 percent. Some other outer-island areas were, however, lagging.

The Indonesian family planning program is basically a pill program, although a variety of contraceptive methods are offered and there are fairly wide regional variations in the proportion using specific methods. In 1979, about 62 percent of program users in Java and Bali were on the pill, and 30 percent were using intrauterine devices (IUD's), with proportions much the same in the outer islands. By international standards, continuation rates for both pill and IUD are good.

Other activities. Experiments have been organized to link family planning activities with other activities designed to improve rural welfare. One such approach combines family planning, nutrition information, and primary health care. Another provides incentives for active community participation in institutionalizing the small family norm.

Population redistribution policies, which considerably predate policies to reduce population growth rates, have continued to receive major emphasis. The highly ambitious target set for the transmigration program in the Third Five-year Plan period (1979–1984) calls for the movement of half a million households, or more than 2 million people altogether, from the Java-Bali-Lombok area. If achieved, this would draw off about one-fourth of annual population increase in these source areas. Major road-building projects in the outer islands are expected to encourage independent movement of people to settle newly accessible areas and to engage in trade and other activities. There is general concern about the growth of big cities, and the governor of Jakarta in 1970 declared Jakarta a "closed city" as one in a series of policies to stem the flow of migration. The effectiveness of these measures appears to have been limited. Regional development policies are aimed at a more even pattern of development in Indonesia and, if they succeed, would have major implications for population redistribution.

Scholarly Activities. The volume of demographic teaching and research in Indonesia increased greatly during the 1970s. The Demographic Institute of the University of Indonesia organized a major program of training lecturers from universities and other tertiary institutions, as well as government servants, in demography. The Population Studies Centre of Gadjah Mada University established a population research training program that further develops the research capabilities of many of those trained at the University of Indonesia, among others. Demographic institutes have also been established at a large number of regional universities, while a growing number of Indonesians have been trained abroad in the field of population.

Aside from university centers, other major focuses of population research are the Population Studies Centre of the National Institute of Economic and Social Research (LEKNAS), the Central Bureau of Statistics (BPS), the National Family Planning Co-ordinating Board (BKKBN), the Population and Manpower Division of the National Development Planning Agency (BAPPENAS), and the National Institute of Health (PPPPH).

The Association of Indonesian Demographers (IPADI) was established in 1973 and holds a congress every three years. The association publishes a regular newssheet *Berita IPADI.* A scientific journal, the *Majalah Demografi Indonesia* (Indonesian Demographic Journal) has been published twice yearly since 1974.

A wide range of population research is conducted in Indonesia, most of it funded by Indonesian government departments and some by foreign sources including the World Bank, the United Nations Fund for Population Activities, and the United States Agency for International Development. Indonesia participated in the World Fertility Survey in 1976.

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See also ASIA.

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INFANT AND CHILD MORTALITY

The rate of infant mortality is conventionally measured as the number of infant deaths per year per 1,000 live births during the same year. Subrates, which sum to the total rate, are based on the age of the infant at death: those most frequently measured are the neonatal mortality rate for deaths under 28 days and the postneonatal rate for deaths from 28 days through 12.0 months of age.

Because not all infants who die in a given year were born in that same year, the infant mortality rate may be an approximation of the true probability of death in the first year of life. If the number of births does not fluctuate much from year to year, it is a reasonably good representation of that probability.

Fetal deaths are not included in the infant mortality rate. They occur prior to live births and include stillbirths, miscarriages, and induced abortions. A perinatal mortality rate combines late fetal deaths (stillbirths usually over either twenty or twenty-eight weeks of gestation) with deaths less than one week after live birth. Formulas used to calculate perinatal death rates differ with respect to fetal and infant age and the inclusion of fetal deaths in the denominator. Differences in the classification of fetal deaths and deaths in the first hours after birth, or in registration practices, also make it difficult to compare the components of perinatal mortality rates across countries.

The child mortality rate is usually defined as the deaths of children from age 1.0 to under age 5.0 per year per 1,000 children of the same ages.

Complete data on births and deaths are available for less than one-third of the world population, and deaths of infants and children are especially likely to be unrecorded. Registration in most developed countries is considered to be essentially complete, but in developing countries the infant and child death rates are often estimated by indirect methods from demographic surveys, census data, and such birth and death records as do exist. [*See* INDIRECT ESTIMATION OF FERTILITY AND MORTALITY.]

Current Levels and Trends. A very rough estimate of the current world infant mortality rate is about 100: under 20 in most of the developed countries, below 10 in a few, and well over 100 in many Asian and African countries. These high rates, which are usually estimates, are averages. In some years the rates are at least 200 to 250 (one child in four) in some geographic areas and among some ethnic groups. The worldwide variation is such that in Japan and Scandinavia less than one child in a hundred dies in infancy. Table 1 shows data from a selection of the countries listed in the *Demographic Yearbook, 1978* (United Nations, 1979). Countries were selected that had data available from 1970 or later, which excluded the highest mortality countries. The rates for Scandinavian countries are also not shown because the demographic yearbook does not include rates when the total number of deaths per year is fewer than one thousand.

From 1950 to 1975, there was an annual 4 to 5 percent decline in infant mortality in most developed countries; exceptions were Japan, which started at a much higher

TABLE 1. *Infant mortality rates, selected countries, various dates*

Country and year	Rates
Africa	
Egypt (1975)	89.2
Ghana (1970)	59.4
Liberia (1970)	137.3
Tunisia (1974)	52.1
North America	
Costa Rica (1976)	33.2
Dominican Republic (1975)	43.5
El Salvador (1976)	55.2
Guatemala (1972)	79.0
Mexico (1975)	52.8
Puerto Rico (1977)	20.1
United States (1975)	16.1
South America	
Chile (1974)	65.2
Peru (1972)	75.5
Venezuela (1975)	43.7
Asia	
Hong Kong (1977)	13.5
Israel (1977)	17.8
Japan (1977)	8.9
Philippines (1974)	58.9
Thailand (1976)	25.5
Europe	
Austria (1976)	18.2
Bulgaria (1976)	23.5
Czechoslovakia (1976)	21.0
France (1976)	12.5
Yugoslavia (1975)	39.7
Oceania	
Australia (1977)	12.5

Source of data: United Nations, 1979, table 16.

level than did the Western countries and achieved a 7 to 8 percent annual rate of decline, and the United States, England, and Australia, which lagged at a rate of 2 to 2.5 percent (Vallin, 1976, p. 654). In the Soviet Union, there is evidence that a long-term decline was reversed in the 1970s (Vallin, 1976, p. 654). Close to two-thirds of infant deaths in low-mortality countries are now concentrated in the first week after birth, a period when prenatal factors and difficulties at parturition predominate. Mortality on the first day of life in many of these countries exceeds that in the entire postneonatal period.

It is often difficult to know either current levels or the pace of decline in infant mortality in developing countries. Improvements in registration systems and surveys increase the number of deaths reported and can conceal a reduction in mortality, but where declines have been recorded they have been approximately at the same rate as in the developed countries. Progress, however, seems much less regular; unfavorable events, with natural causes or with social, political, or economic causes, can halt or even reverse a declining trend. Fluctuation in mortality rates reflecting periods of extreme economic hardship and civil unrest is illustrated by data for the 1970s from Bangladesh, where temporary upward trends in infant and child mortality were concurrent with severe food shortages. Data for São Paulo, Brazil, indicate that there may have been a rise in infant mortality rates as great as 48 percent during 1960–1970, which has been attributed to a substantial decline in the real minimum wage during that period (Carvalho and Wood, 1978). An increase in the infant mortality rate from 43 to 48 was reported from Sri Lanka after a period of decline that had lasted more than thirty years. Reliable time-series data on mortality are generally not available for developing countries, but some analysts find that rates appear to be stabilizing at relatively high levels (Gwatkin, 1980).

Estimates of child mortality suggest that when infant mortality is high, the risk of death may also be quite high in the second and third year of life. This risk is associated with the diarrhea and malnutrition that occur so frequently when weaning foods are both inadequate and a source of infection. Differentials among countries in childhood mortality are even starker than in infant mortality. Estimated rates that are approximately 40 per 1,000 children in tropical Africa are more than forty times higher than rates in developed regions (Dyson, 1977, p. 288).

Causes of Death. Infant deaths are sometimes separated into two categories: (1) "exogenous," when death is caused by infectious, parasitic, and respiratory diseases, accidents, and other environmental and external causes and (2) "endogenous," when death is the result of factors such as congenital malformations, the circumstances of prenatal life, and the birth process. Exogenous causes predominate in those deaths that occur after the first month of life, the postneonatal deaths, and most deaths in the first days and weeks are the result of endogenous causes.

As noted, in low-mortality countries deaths after the first twenty-eight days constitute a small proportion of total infant deaths, albeit with significant variation within countries by socioeconomic status. Major causes of infant death, consequently, are those responsible for perinatal mortality (anoxic and hypoxic conditions, conditions of placenta and cord, birth injury and difficult labor, and others), followed by congenital anomalies and pneumonia. In developing countries, infective and parasitic diseases and pneumonia are the major causes, acting synergistically with nutritional diseases. Causes of child mortality are for the most part environmental at all levels of mortality, but there are differences between more-developed and less-developed regions, as shown in Table 2.

A study of the patterns of mortality in childhood in

TABLE 2. *Three leading causes of death in early childhood (ages 1 to under 5 years)*

	1st cause	2nd cause	3rd cause
Less-developed countries	Influenza and pneumonia	Gastritis and enteritis	Accidents
Developed countries	Accidents	Influenza and pneumonia	Congenital malformation

SOURCE: Dyson, 1977, p. 293; reprinted by permission.

Latin America from 1968 to 1971 found that diarrheal disease was the major underlying cause of death of about 30 percent of the deaths of children under 5 years of age (Puffer and Serrano, 1973). Nutritional deficiency was an underlying or an associated cause in 35 percent of the deaths. Breastfed infants were found to be at a lower risk of mortality from nutritional deficiency as an underlying or associated cause than those infants who were breastfed for only limited periods, or not at all.

Infant death rates, when plotted on a graph according to the age of the mothers, usually form a U, or a J, or a reversed J, indicating higher risks at maternal ages under 20 and over 35. Rates plotted according to birth order usually form a J, with risks higher for the first-born child than the second-born child, and steeply climbing mortality rates after the third or fourth child. These patterns are consistent across all levels of mortality. Mortality rates may be higher when pregnancies are closely spaced. The first born of a pair may be at risk of early weaning and decreased food supply. Both first and second child may be at risk because of biological and social stresses that the mother may experience when intervals between births are short. It should be noted that these conditions of risk affect also the chances of maternal mortality. Complications of pregnancy and childbirth are increased when women already have three or more children, or when they are younger than 20 or older than 30 to 35. When both age and birth order are unfavorable, the risks of complications, and of infant death, are even higher (Nortman, 1974).

Data on birth weight are scarce because it is only in the last few years and in a few countries that weight is noted on the birth certificate; this information is rarely available for developing countries. Reports from Europe indicate that low birth weight (under 2,501 grams), which characterizes from 3 to 10 percent of all births in that region, is associated with about 50 percent of neonatal deaths (Manciaux, 1978, p. 29). Birth weight has been found to be strongly associated with chances for survival also in the postneonatal period, along with other factors discussed here (Shah and Abbey, 1971).

Socioeconomic Differentials. Infant and child mortality rates can vary among groups within a country as much or more than they vary among countries. Throughout the Third World, conditions of life in rural areas for infants and children are very often worse than they are in the cities. Hugo Behm, in his analysis of mortality in the first two years of life in Latin America, found that rural rates exceeded the urban by 30 to 60 percent in two-thirds of the twelve countries studied (Behm, 1979).

Comparable differences in mortality rates exist between geographic districts in urban areas, and they can persist even when overall mortality levels are low. In Buenos Aires, for example, when overall infant mortality was about 30, the rates in geographic regions in the city ranged from 17 to 45 (Behm, 1979, p. 11). In New York City, in 1979, when the overall rate was 16.7, the lowest rate among the geographic districts was 7.4, and the highest was almost three and one half times greater at 25.3 (New York City, n.d.).
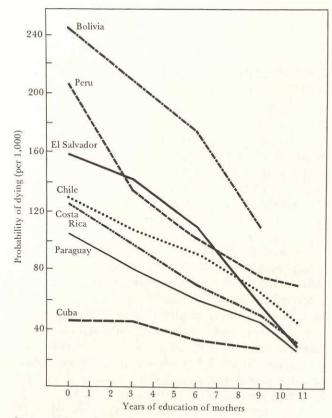
The level of education of the mother has been a very strong predictor of infant and child mortality rates. As the education of the mother increases, rates go down; this consistent finding is attributed in part to improvements in a mother's ability to provide care, including use of health services, and in part to the correlation of education with other indicators of living conditions and access to resources. Figure 1 shows that the link between maternal education and infant and child mortality is found at both high and relatively low mortality levels.

Other indicators of socioeconomic status that have been used in analyses of differentials in mortality rates include family income, father's occupation, housing conditions, legitimacy of the child, and ethnic group. These variables have been used singly or in multivariate analyses of their additive effects and their interactions. Differences among investigators in indicators and in methods for measurement and statistical tests have made it difficult to compare results, but findings that do not confirm the marked relationship between low socioeconomic status and high infant and child mortality rates are extremely rare.

Causes of Decline. The explanation of declines in infant and child mortality rates that is most often proposed is improvements in overall socioeconomic conditions, including availability of prenatal, obstetric, and pediatric services. There is evidence that concerted efforts to provide basic water and sanitation and health services can lower the risk of death even when real family income remains low or falls to lower levels. In countries where most deaths are in the neonatal period, advanced technology for the care of the newborn has saved many infants who would have had little chance for survival just a few decades past.

Extension of family planning programs and widely-available contraceptives are given credit for reducing in-

FIGURE 1. *Mortality under two years of age by education of mothers, Latin American countries, 1966–1971*

SOURCE: Behm, 1979, p. 16; reprinted by permission.

fant mortality because they tend to lower the number of births to very young and older women, births of high order, and closely spaced births (Maine, 1981). Another important advance against infant and child mortality in developing countries is occurring with the dissemination of information on the treatment of diarrhea, by the family in the home, with oral rehydration. Certainly prevention is preferred, but such simple, effective treatment of sick children can sharply decrease mortality rates.

Fertility and Infant Mortality. In many societies, though not all, declines in infant mortality have been followed by reduction in fertility, and the relationship between the two (sometimes called the "child-survival hypothesis") has been examined and discussed extensively. One theory concerns the physiological effects that may occur in societies where breastfeeding is widely practiced. The death of a child shortens the amenorrhea associated with lactation and thereby may increase fecundity and shorten intervals between births. Empirical studies indicate that this effect is not large (Preston, 1978). A second theory is concerned with the "replacement effect," that is, that parents are motivated to produce additional

children to replace those that are lost. A third, widespread, idea is that parents do not limit their children until they are reasonably sure that a sufficient number will survive to adulthood. An "insurance effect" is operating when the reproductive norms of parents in high-mortality societies exceed the level necessary to achieve their ideal completed family size. Social norms and customs that promote early marriage and frequent childbearing are also seen as possible societal responses to the experience of high infant mortality.

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Related material can be found in BREASTFEEDING. *See also regional and country articles.*

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INFANTICIDE

Infanticide is the practice of killing offspring at birth or soon after. As a method of population control, or control of family size, it has been employed on every continent and in every type of culture from the primitive to the highly civilized. It was performed on a large scale in ancient Greece and Rome and in imperial China as a normal cultural practice. In Europe, it was widespread until the latter half of the nineteenth century. No one factor explains infanticide in all these societies. It has served to eliminate motherless infants, multiple births, and illegitimate and deformed children; to space children; to regulate future adult sex ratios; and to adjust family and community size to food resources, subsistence patterns of the society, or nomadic conditions.

In most societies, the greater number of infants killed were females, with the effect not only of removing the immediate burden of a child with little or no economic value but also of reducing the number of potential childbearers. In classical Greece, upper-class families rarely raised more than one daughter, which resulted in severe distortions of adult sex ratios. A few exceptions to the preference for female infanticide have been reported, such as the custom of the Rendille camel herders in Kenya of limiting heirs to the herd by killing all males born on certain days and those born after the eldest brother has been circumcised. Infanticide was sometimes preferred to abortion because it allowed for sex selection and did not endanger the life of the mother.

In many cultures infanticide was an approved means of protecting older children in the family from starvation, particularly when an older sibling had not yet been weaned. The infant often was not considered fully human at birth and was not accepted into the social group until it was named or went through a ceremonial initiation. The time for such initiation varied from a few days to several years after birth. Killing before that might carry no stigma. Attitudes toward infanticide have ranged from open approval to that embodied in the sixteenth-century criminal code of Emperor Charles V.

Under this code, all who were guilty of infanticide (usually the mother) were to be buried alive, impaled, or drowned. The concealment of pregnancy was a crime because it was considered to be a sign of the intention to murder the child. This change in moral outlook is largely attributed to the spread of Christianity, not only with its encouragement of large families and commandment against killing but also with its belief that an unbaptized child could not enter heaven and was condemned by infanticide to spend eternity in limbo.

There is some dispute as to the frequency with which the above penalties were imposed. It was usually married women who were charged with the crime, but few convictions are recorded and sentences were light. The extent of the practice of infanticide cannot be known precisely, but there are estimates that it was the most frequent crime in Europe from the Middle Ages to about 1800. In England, as late as 1878, perhaps 6 percent of all violent deaths could be classified as infanticide motivated by poverty and illegitimacy. One method of infanticide, "overlaying" or smothering an infant who shared a bed with its parents, was so common that in some European countries sharing a bed with a small child was forbidden.

In the eighteenth and nineteenth centuries in Europe, there was a marked increase in illegitimate births. These infants were very often abandoned in streets, alleys, ditches, or church doorways. When foundling hospitals were established in Paris, London, and other European capitals in an effort to save the lives of these abandoned children, they were quickly overwhelmed by the numbers and could not find sufficient wet nurses to feed them. Provisions for anonymous delivery of infants by means of revolving boxes at the doors brought more than 164,000 to French hospices in 1833. The mortality among the children in these foundling hospitals, in the country parish workhouses, or in the "baby farms," was so high, up to 80 percent, as to be called legalized infanticide. "Killer nurses" or "angelmakers" were terms used for the wet nurses who ran baby farms and used lethal doses of opiates to quiet their charges.

Although a few geographically remote societies are known to continue the practice of infanticide, it has generally been abandoned as a means of population control, and it is considered a crime by national governments all over the world. It is the question of euthanasia for defective children that has emerged as the current ethical and legal infanticide issue.

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INTERNAL MIGRATION

1.

DETERMINANTS

This article reviews the basic theoretical approaches for explaining migration. Both economic and noneconomic approaches are considered. Although the discussion and evidence are couched primarily in terms of rural-urban migration in developing countries, the theories are applicable to migrants of all types.

Economic Theories of Migration. The basic economic model of migration assumes that potential migrants rationally weigh the costs and expected returns of moving. If the expected returns exceed the costs, migration ensues. Thus, migrants are expected to move from low-income to high-income areas. Historical migration patterns in many different nations confirm this expectation.

But there are exceptions. Why do migrants continue to pour into cities already filled with the unemployed, where housing is not available and living conditions leave much to be desired? Conversely, why don't all persons leave low-income areas?

Income differences. Michael P. Todaro (1976) has demonstrated that it is not the real income or employment differences but the perceived income and employment opportunities that motivate migrants. The probability of rural-urban migration is directly related to the perceived rural-urban income differential and the probability of obtaining a job in the city. Costs of moving reduce the probability of migration. The Todaro model has been empirically tested in a number of countries, and it performs fairly well with both aggregate census and survey data.

The relevant income differential is future income. Some migrants expect their early postarrival earnings to be low, but anticipation of higher future earnings stimulates their move. The salience of future earnings differentials accounts for a higher migration rate among young persons aged 15 to 30 years. Youth expect to earn the higher urban income for a greater number of years; therefore, given the same actual difference in earnings, younger persons anticipate a greater rural-urban income difference than older persons. If potential migrants also consider the tendency for urban incomes to inflate faster than rural incomes, the perceived differential for youth becomes even larger.

A desire for income security also motivates migration. If future income is perceived as unstable or falling, the net effect is to reduce the expected rural income level, as, for example, when agricultural prices are regulated by the government or a series of years of bad crops lowers yield expectations. Permanent rural out-migration is not always the preferred or only means by which to enhance the rural household's income security. In some instances a household may simply send one of its members to town to obtain work and remittances to carry the household through periods of low earnings. This practice is especially common in the West African nations of Ghana, Niger, and Nigeria, but it is also evidenced in Peru and other Latin American nations.

If the potential migrant perceives the likelihood of urban income growth to be greater than that for rural income, the perceived future differential will also be larger, which increases the chance of migration. In rural areas, one measure of low rural income mobility has been inequality of the distribution of land. R. Paul Shaw (1974) demonstrates with Chilean data that the greater the inequality, the lower the income mobility and the higher the rate of out-migration.

A final issue related to the rural-urban income differential concerns level of skill. Because it has been assumed that the unskilled rural residents aspire to wages for factory jobs or other occupations in the modern sector, the income differential has been couched in terms of farm versus urban modern sector. Numerous case studies illustrate that it is the educated who are more likely to move. (See Findley, 1977; Simmons, Díaz-Briquets, and Laquian, 1977.) If that is so, the more relevant differential is for educated or skilled work. Because the returns for education tend to be greater in urban areas, without a correction for comparable wage or income levels, the differential may be underestimated. For example, substantial differences in rural-urban migration rates for educated versus noneducated Tanzanians are associated with sharper rural-urban wage differentials for additional years of schooling (Barnam and Sabot, 1976).

Not surprisingly, the most overwhelming support for the economic approach to migration derives from the substantial body of empirical evidence validating the theory that migrants are attracted to higher-income areas (Findley, 1977). In nations as seemingly different as

Papua New Guinea and the United States, migrants follow common routes from the low to high income areas (Conroy, 1977; Greenwood, 1975). Generally, migration to higher income areas is equivalent to migration to large cities, but in some parts of Africa and Latin America the high wage zones include rural mining and cash crop agriculture areas (Adepoju, 1974; Portes, 1978).

It is interesting to note, however, that the urban income variable is not necessarily the strongest factor determining migration. In many situations, the cost of moving as measured by distance or absence of kin is more important. Henry Rempel includes both distance and presence of kin at the destination in his model of Kenyan rural-urban migration, and both variables are shown to be highly significant, while the perceived income level is not (Rempel, forthcoming).

The theory that low rural incomes accelerate out-migration is not consistently supported by empirical evidence. Certain types of potential migrants respond more strongly to low rural incomes than do others. In Sierra Leone, for example, the less-educated rural-rural migrants were very sensitive to rural income levels, while these had little impact on rural-urban migration, especially among those with some education (Byerlee, Tommy, and Fatoo, 1976).

Perceived probability of employment. Income differences are not the sole economic factors influencing migration partly because the difference is realizable only if the migrant can find work. Therefore, levels of unemployment or underemployment in an area are likely to reduce migration to that destination. Why then is there evidence of migration to cities with high rates of joblessness? Tests of the economic model in several countries, including Brazil, Costa Rica, Kenya, and Sierra Leone, show that urban unemployment levels have no significant negative effect on urban in-migration (Findley, 1977).

Just as the relevant income criterion is future income, the relevant employment criterion is the probability of obtaining a job in the modern, or formal, sector by the end of a specified waiting period. During the waiting period, migrants are either unemployed or are underemployed in the traditional, or informal, sector. Most analysts assume an increased probability of employment with length of residence as a result of expansion of migrant networks; eventually migrants are assumed to find jobs at the desired income levels. Younger migrants are assumed to tolerate a longer waiting period, partially because they expect payoffs spread over a longer period once they obtain a job, but also because their waiting costs are lower. Younger migrants generally are unmarried and without dependents, so their income needs are smaller than for migrants with families. Also, migrants, especially the young adults, often stay with friends or family until they find some form of employment. Thus, the theory can account for the exceptionally high rural-urban migration rates of the young, even to cities with high unemployment levels (Nelson, 1979).

Many jobs are available only to persons with specified education levels or skills. Gary S. Fields (1975) has shown that if there is a priority for educated persons in all jobs (skilled or unskilled), the probability of migration for uneducated persons drops. Thus, overall urban unemployment levels or the number underemployed in the urban informal sector do not necessarily affect urban in-migration. The more relevant employment probability variables are education and urban kin or contacts who can expedite the job search.

An alternative explanation for the failure of high urban unemployment levels to deter urban in-migration lies with the difference in aspirations between migrants and the urban-born. Rural-urban migrants are often willing to take lower-paying jobs that native city dwellers disdain.

The fact that many migrants enter the informal sector demonstrates the weakness of the assumption that migrants singularly strive for formal-sector jobs. The standard economic model of migration allows for migrant underemployment in the urban informal sector, but all migrants are assumed to aspire to formal-sector jobs. In fact, studies of migrants in the informal, or small-scale, sectors of Lima, Belo Horizonte, Nairobi, Kuala Lumpur, and many other cities show that migrants respond to the perceived urban opportunities for entrepreneurship (Nelson, 1979). Many move, start by working in a family enterprise, and eventually develop a small firm of their own. Thus, urban, formal-sector wage and employment rates are unlikely to affect the migrants, who envision themselves ultimately as independent entrepreneurs. For these migrants, urban contacts, closeness to the rural community base for marketing endeavors, and a large potential demand for their products or services more strongly influence migration than do formal-sector employment levels.

If limited employment prospects in the country compel rural youth to look elsewhere for jobs, improved off-farm employment prospects will reduce out-migration. Empirical findings from Bolivia, Indonesia, Nigeria, and Sierra Leone show that areas that offer off-farm employment have reduced net out-migration.

For persons who move in order to supplement meager farm earnings, availability of jobs in rural areas or nearby cities can reduce the need to look for jobs in more-distant states or cities, thereby reducing aggregate, interstate, or rural-metropolitan migration rates. Unemployed turtle fishers on the west coast of Nicaragua prefer inland plantations to Managua (Nietschmann, 1979).

However, if the jobs are located in nearby cities, when persons move to take the jobs, they are still rural-urban migrants. There would only be reduced rural-urban migration if the jobs were within commutation range and those employed in nonagricultural jobs continued to live on their rural farms. Studies of circular mobility in Asia show that the rural poor who live close to cities respond to poverty by daily to weekly commuting to the city to undertake some form of urban occupation (Goldstein, 1978). Hence, although they effectively participate in the urban labor market, they are not considered rural-urban migrants.

Costs of moving. Even if the individual anticipates net income gains from migration, the cost of moving still may prevent migration. Generally, the cost of moving has been operationalized as the distance between the origin and the urban destination. Increased distance results in increased transportation costs for moving or for visits back to the origin community, hence representing both the actual and "psychic" costs of moving. Where various ethnic groups are clustered in distinctive regional groupings, distance represents the psychic cost of living among other ethnic groups. Where the ethnic groups stress involvement in the home community, migration to faraway destinations is less likely.

Origins located farther from cities are also assumed to have fewer contacts with the potential destination, which in turn means less reliable and more uncertain information. Uncertainty causes potential migrants to discount information about urban income or employment differences; therefore, distance reduces the perceived income difference.

Distance has been a significant deterrent to migration in the majority of studies including it. Yet it is not always a deterrent. If the rural-urban employment and income differences are extremely great, they can swamp the effects of distance and related migration costs. Alternatively, distance between origin and destination may not correlate with migration costs. Other migration costs not necessarily captured by the distance variable include the urban cost of living, urban crime, and other negative life-style factors.

The presence of kin in urban destinations reduces costs to the migrant and increases the probability of moving. Among other things, kin tend to provide shelter, food, and help in obtaining employment. Studies in Brazil, Kenya, India, Korea, and many other nations highlight the importance of kin in determining migration (Findley, 1977; Simmons, Díaz-Briquets, and Laquian, 1977).

Noneconomic Theories of Migration. Researchers in noneconomic disciplines do not dispute the basic economic realities behind rural-urban migration. Rather, their work focuses on sociocultural elements that shape the potential migrant's response to economic pressures. In particular, their research helps explain why some do not move and why choice of destination is not always consistent with the economist's expectations.

Attraction, repulsion, and intervening obstacles. Samuel A. Stouffer (1940) has described migrants as being attracted by a set of positive factors at their place of destination while they are repulsed by negative factors in their place of origin. To move toward the attractive forces, they must overcome a series of intervening obstacles. The greater the net attraction, the more likely migrants are to overcome intervening difficulties. Many of the attractive and repulsive forces are economic, but noneconomists additionally stress the importance of social, cultural, and geographic factors, such as cultural compatibility, constraints on land transfers, or family conflicts. Intervening obstacles include cost or lack of transport, lack of integration with the national road system, closer acceptable destinations, limited information about potential destinations, no urban kin or other contacts to assist the migrant upon arrival, no linkage to urban areas through governmental services, and familial constraints on the movement of a household member.

Personal characteristics of the potential migrant affect his ability to overcome intervening obstacles. In general, migrants tend to be positively selected with respect to youth, education, and household income relative to nonmigrants in the place of origin. Over time, it is assumed that there will be less difference between sending and receiving areas, more kin in the place of destination, and greater ease of access, thereby reducing intervening obstacles and resulting in less selectivity of migrants.

A further noneconomic factor affecting migration is that migrants are more likely to leave under certain familial or cultural situations. First, larger households are much more likely to send some members elsewhere. In one Mexican community, for example, rural families with more than five children are four times more likely to have migrant daughters (Arizpe, 1978); in another Mexican village unless there are a certain minimum number of adults, migration will not ensue (Weist, 1973).

Second, communal or cultural factors may either facilitate or hamper out-migration. Ronald Skeldon's historical analysis of Peruvian migration patterns (1977) illustrates that villages that have a strong migration history are much more likely to continue the migration tradition. Present migration may be adapted to different purposes or destinations; nonetheless, the tradition continues. Conversely, groups that are relatively isolated or culturally "closed" or that have very strong communal ties tend to have lower rates of out-migration. For example, among the Pahari of India the traditional response to a mismatch of population and resources has resulted in one

of two adjustments: modification of the household composition through one of several possible marriage conventions or establishment of a new household on the village's more distant land holdings. Up until recently, migration has not been common among the Pahari, probably because it has been possible to meet the changing demands within the societal and ecological structure (Berreman, 1978).

Migrant selectivity. Elaborating on the laws of migration proposed in the nineteenth century by Ernst Georg Ravenstein, Everett S. Lee (1969) posits four hypotheses concerning the relation between the structural factors stimulating (or opposing) migration, the intervening obstacles or conditions limiting a migration response, and the selectivity of individual migrants. "Selectivity" is defined as significant differences from the origin population with respect to certain characteristics.

1. *More attractive forces at the destination increase migrant selectivity; conversely, stronger influence of repulsive forces at the destination reduces selectivity.* Generally, the places with the most attractive forces have been a nation's metropolitan areas; therefore, these areas should also have the highest proportion of selective migrants. Studies have shown that the better educated and those with some nonagricultural job training are overrepresented among metropolitan in-migrants (Findley, 1977).

The converse has also been proven, namely that migrants who are driven by economic or social necessity are less or negatively selected. These migrants are more likely to go to "less attractive" destinations, typically rural areas and small towns. The village studies assembled by Connell et al. (1976) have shown that the less educated, the very poor, and the unskilled have a greater likelihood of choosing a rural or small-town destination.

2. *Increased difficulty of intervening obstacles raises migrant selectivity.* Increased difficulty of intervening obstacles translates into greater costs of moving or risk of failure. As the perceived risks increase, migration will be more selective for those who are risk takers, who by virtue of education, contacts, or other resources feel they have a better-than-average chance of success or can survive while waiting for it. Education operates both to increase risk-taking ability and to help the potential migrant assess more accurately the advantages, disadvantages, and difficulties associated with migration to a specific destination.

Intervening obstacles can produce quite different migration patterns for different subgroups. For example, Connell et al. (1976) find both well-educated and illiterate migrants from the same Indian villages, but the two groups differ in constraints, goals, and expectations. The educated wish to use their education as a tool for individual betterment, which is possible only if they migrate,

even though that entails risks. For the illiterate, the need to survive forces household members to move, but not to areas with uncertain payoffs. For them, migration means primarily seasonal, rural-rural movement in pursuit of known employment opportunities. They are more likely to stop at the first intervening opportunity and will not continue searching for other, more elusive opportunities.

The very poorest of the rural poor will not go to the city unless they live within close proximity to it, can stay with kin, or are assured a job prior to arrival. By and large, the very poor are uneducated and may have only limited information about distant destinations. They may be unable to finance a long-distance move to a city and with their lower level of education and skills, obtaining work may be much less likely. Without kin who can afford to feed them while they look for work, the poorest simply cannot afford to take the substantial risk of a long period job searching. Finally, and perhaps most important, the poorest do not have the skills or educational prerequisites for living successfully in the city. Their traditional response has been and continues to be rural-rural migration, both temporary and permanent.

Studies in Argentina, Bolivia, Mexico, the Philippines, Sierra Leone, and Zambia exemplify analyses that document the persistence and strength of rural-rural movements by the rural poor. Regardless of region, they tend to be older than rural-urban migrants, are more likely to be married with dependents, are definitely pushed by poverty, and move relatively short distances to areas where they have kin or friends. Except for the somewhat better-off, who may be able to compete with urban-rural migrants for farms in scarce settlement areas of newly developing, frontier regions, at least at first they do not move permanently. In Bolivia, rural-rural migrants are motivated by low and extremely unstable incomes. They seek contracts for annual seasonal work on one plantation, which they prefer to jumping from one job area to another during the season; the most preferred situation is permanent hired labor (Whiteford and Adams, 1975).

3. *The distribution of migrants with respect to their selectivity becomes bimodal over time.* Bipolarity can be expected if positive forces attract the selective migrants to the same destinations as those to which the less selective migrants are driven. This phenomenon may occur when the original destination chosen by selective migrants remains the most attractive one for them at the same time that better communication links, presence of kin and so on encourage migration by less selective migrants. Alternatively, less selective migrants may include short-distance movers who wish to avoid visits, while the more selective are the long-distance movers.

Although there is evidence of declining selectivity over time, there is little empirical validation of the bipolarity

hypothesis. Bipolarity continues to be accepted as likely, however, because it is one of the clearest theories by which to interpret the seemingly conflicting evidence of surveys regarding migrant characteristics.

The poor who do move to cities may differ in their outlook and strategy from their more selective counterparts. By virtue of their older age and lesser education, the less selective tend to have shorter time horizons. They are much less likely to move to the city with the intention of staying permanently. They seek out immediate income-earning possibilities such as street vending or construction work; therefore, their migration decisions may be more responsive to the immediate availability of work through a job program, or to an opening in a fellow villager's enterprise, or to the word sent back that there is a family in need of a domestic servant. Because they may not view their urban residence as permanent, they seek to retain their rural options. Particularly in Africa but also in parts of Latin America, the instability of urban tenure results in split households with the head living in town sending back remittances to his wife and children who remain in the village. Children may be sent to town for schooling, or the father may return to help with heavy seasonal workloads. Because family enterprises offer the most flexible employment situations, the dual-household strategy is highly dependent on migrants using a family-based migration strategy rather than one based on jobs in the formal sector only.

4. *Certain life-cycle stages are more conducive to migration; therefore, migration is selective for these ages and life-cycle stages.* Clyde Mitchell's hypothesis concerning differential migration propensities at each life-cycle stage is based on the risk-taking concept of migration (Mitchell, 1969). Younger persons without dependents often have fewer responsibilities than older persons, and they have a longer time horizon over which to spread future earnings. They can tolerate longer job search periods without reaching the point where they have literally eaten up all potential gains. Young persons marrying and setting up their own households may be moving out of the house anyway, and moving to another place can easily be incorporated into the transition move to independence.

Traditionally, studies of the life-cycle effect on migration have examined male migration rates and life-cycles. Increasingly, however, migration is undertaken by single women, often with children. In Latin America, teenagers go to cities to work as domestic servants; and in East Asia they move to find factory jobs (Simmons, Díaz-Briquets, and Laquian, 1977). After marriage, the pattern may be typified by the Mexican pattern, where married women are likely to move to town only to join their male kin who have previously left, or upon separation, divorce, or widowhood (Arizpe, 1978).

The life-cycle approach to determining the likely timing of moves is also convenient for explaining the phenomenon of repeat and return migrations. Given a set of structural conditions that necessitate a move, permanent, "once only," rural-urban migration is only one possibility. Indeed, recent research in Indonesia (Hugo, 1977) and several African nations (Southall, 1975) suggests that for many potential migrants it is the least likely outcome. Migrants, especially those leaving for schooling, often intend to return even if they do not do so. To portray the decision process as a rational weighing of lifetime benefits is erroneous. In addition, many migrants move frequently: in steps to larger cities; back and forth between country and city (a common African pattern); or circulating between various cities. Some life-cycle stages are conducive to circular migration, while others are better suited to fairly permanent moves. Thus, there may be not one but several rural-urban migration decisions, each with varying constraints and time perspectives.

Migration as a two-step process. Whereas economists tend to view the migration decision as a single event, many sociologists conceptualize the process in two steps: a decision to leave, followed by a second decision concerning the destination. In Julian Wolpert's model of the two-step process (1965) these decisions depend on three basic variables: the utility of or satisfaction with the place of origin (place utility), life-cycle-related changes in thresholds of minimum place utility, and identification of alternative destinations with a higher perceived utility. With changes in personal or location characteristics the perceived utility of the place of residence can fall and the individual become dissatisfied with the community. When dissatisfaction becomes sufficiently intense, the individual will decide to leave. Then, the person begins searching for better locations. With stress, such as unemployment, the search will be more limited, perhaps resulting in stereotyped or less than optimal choices. For this reason, the potential migrant's awareness of alternative destinations is especially critical to the choice of destination. On the other hand, potential migrants experiencing little or no current stress can undertake a lengthy and complex search, involving attempts to locate jobs prior to leaving.

Empirical tests of the two-step decision model support the validity of the approach, particularly for the selection of one out of several possible destinations. With increased complexity in urbanization patterns and prior migration streams, separate analysis of the destination selection process becomes essential to understanding and predicting likely migration responses to the changing urban and rural dimensions.

Kin and the reduction of migration risks. The migration patterns of the poorest groups demonstrate the impor-

tance of kin or friends for reducing intervening obstacles. Information about the destination can reduce some of the uncertainty about potential migration outcomes, and provision of shelter, food, or help in finding a job all reduce the chances of failure after arrival. The very low unemployment levels of recently arrived migrants demonstrate that many had arranged for their jobs before moving.

Other migrants enter the urban informal sector, where they may be employed by kin or friends or where kin networks are vital to the establishment of a family enterprise such as a tea stall, shoe repair shop, or laundry. Studies increasingly demonstrate that many migrants do not aspire to one of the scarce, salaried jobs. They choose the informal sector because it allows them a freedom and potential not found either in the rural areas or in the formal sector of the cities (Nelson, 1979). For these persons, kin or urban contacts provide valuable information concerning potential markets, where to set up business, and how to obtain (or avoid obtaining) the necessary permits.

Synthesis of Findings from the Economic and Noneconomic Approaches. For most persons, migration is spurred by a search for better economic prospects. But family and cultural considerations also play major roles in determining who migrates and where. What may be economically optimal for one type of person will be inappropriate for someone of a different family, educational history, or cultural group.

The previous discussion reviews the basic hypotheses that have guided migration research. The following summarizes the major findings and qualifications.

1. *Migrants move from areas of low economic opportunity to those of perceived high economic opportunity.* Of all the migration hypotheses, this is the one most overwhelmingly accepted. However, "economic opportunity" must be appropriately defined. The following are the refinements that have proved necessary: (a) actual difference between origin and destination income; (b) perceived difference between origin and destination income; (c) perceived difference in attainable future incomes, as weighted by the different origin and destination probabilities of employment and expected future income; (d) perceived difference in attainable future incomes, discounted by the cost of realizing that difference (i.e., the opportunity cost of moving and unemployment after moving). Thus migrant decisions are influenced by a complex set of perceived economic expectations. Potential migrants tend to weigh heavily their expectations of a somewhat higher, more stable, and increasing urban income against the expectation of low, unstable, relatively declining, rural incomes.

2. *The greater the level of "attraction" to a destination, the greater the selectivity of the migrants.* If the difference between the economic and social opportunities of two places is great, migration to the area of greater opportunity (the biggest city or cities in general) will tend to be selective for the better educated, the young, the skilled, and those with some financial or familial resources to facilitate their efforts. These are the risk takers, also the ones likely to receive the most payoff from an urban career and the least return for remaining in a rural area. They are also the ones most likely to overcome all the obstacles between a decision to move and the accomplishment of the goals for which that move is undertaken.

Conversely, the more the potential migrants are responding to expulsive factors at the origin, the lower the selectivity of the migrant stream. Persons pushed by poverty, by family stress, or by other negative factors will tend to be less well educated and generally less able to take large risks. These migrants prefer destinations where they are more certain of finding work, regardless of salary level. Depending on the type of job and resources available to the migrant, the chosen destination may or may not be the largest metropolitan area. Many go to other rural areas to work on plantations, in mines, or at other wage labor positions.

3. *Costs of moving or intervening obstacles reduce migration and increase selectivity of the migrant stream.* The cost of moving is often the strongest variable influencing migration. It can also be an intervening obstacle, which the potential migrant must overcome in order to succeed. As with the economic differential, the precise form of the relevant cost varies. Rempel and others have shown the cost of moving to include the following: (a) road distance between the origin and destination; (b) cost and frequency of transportation; (c) limited information about the destination; (d) different cultural or linguistic groups at the destination; (e) lack of friends or family to stay with at the destination; (f) nontransferrable responsibilities for children or a subsistence farm plot.

4. *The decision to move and the selection of a destination are influenced by different factors.* While the decision to leave is largely influenced by perception of differences in economic opportunity, selection of a specific destination depends on whether specific contacts or family are present in that place, the cost of moving there, and whether acceptable destinations exist closer to the potential migrant's home. Migrants usually choose the closest destination that balances their desire for economic and social assimilation and the chances of realizing that objective. Faced with the same basic sets of rural-urban income differences, male and female migrants may choose vastly different destinations depending on their spatial awareness, monetary resources, sex-related employment constraints, and familial restrictions on movement.

The selection of the most appropriate destination is

also limited by the potential migrants' resources. Young people who have left school may visit one or more cities before moving to one of them, while others may move to the closest or only known destination because they have neither time nor resources to undertake a search. In general, the more the migrant is driven by necessity, the less he or she is likely to shop around for alternative destinations.

Selection of a specific destination has been shown by Wilkie (1971) and others to be influenced by (a) proximity to the city (to minimize moving and visit costs); (b) presence of kin in alternative destinations; (c) information about alternative destinations; (d) city amenities or quality of life; (e) specific types of employment available; (f) duration of migration (seasonal, circular, permanent); (g) cultural similarities.

Conclusions. In sum, variations in migration rates result from the joint interaction of spatial differentials in economic opportunity and individual differences in response to the differential opportunities. Sharp opportunity differentials between two areas enhance the likelihood of movement from the low- to high-opportunity area. But not all individuals in the low-opportunity area will want to move and also be able to move. Some persons will not perceive the differential or, if they do, may not feel it applies to their own situation. Others will be all too aware of their situation but, for one reason or another, find that migration is not a feasible or desirable response. Still others will move, but their destination choice will be more constrained and they may not go to the area with the most opportunities. The actual migration pattern that emerges will reflect the complex interplay of geographical and individual differences in economic and sociocultural factors.

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See also CIRCULATION; URBANIZATION, *article on* DEVELOPING COUNTRIES.

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2.

MODELS

Models of internal migration express theories of causation, usually in quantitative terms, in order to estimate and predict volume and other characteristics of migration flows. Models may apply to groups of people, to individual migrants, or to a dimension of migration such as net migration or in-migration. Some models incorporate change in operating characteristics over time and others are static. A model may be deterministic, in that precise relationships between migration and preceding conditions or events are defined, it may be probabilistic and deal with likelihoods of migration for specified populations, or it may combine these perspectives.

Early models were influenced by Ernst Georg Ravenstein's pioneering work in the nineteenth century, relating migration to the size of the population at two geographic points and to the distance between them (Ravenstein, 1976). This conception was later formulated by George K. Zipf as P_1P_2/D, with P_1 and P_2 representing population size and D representing distance. It was assumed that people move as if drawn by a gravitational force that diminishes with distance; the number of persons who move between any two areas is directly proportional to the product of the two populations and inversely proportional to the distance between them. The model is symmetrical, assuming equal flow in both directions. It does not specify why there is such an interaction and it ignores characteristics of places of origin and destination, or of migrants, that could influence both the volume and direction of movements.

Zipf's gravity model was modified by Samuel A. Stouffer, who incorporated the concept of intervening opportunities. The number of movers over a given distance is directly proportional to the number of opportunities at that distance, and inversely proportional to the number of intervening opportunities and competing migrants. The number of intervening opportunities encountered, such as housing vacancies and jobs, are expected to increase with distance. With this modification the gravity model can better predict different volumes of migration between places. In one version, the number of persons moving to an area is directly proportional to the number who have already made that move; the process is contagious and once the migration is well begun its continuation is semiautomatic.

The basic model proposed by Ira S. Lowry (1966) expands the concept of jobs as opportunities with three variables that indicate their relative number—the size of the nonagricultural labor force, unemployment rates, and manufacturing wages. The gravity model has also been elaborated to include the size and geometric shape of areas of origin and destination, the distribution of the population within these areas, and "attractiveness factors" such as the degree of urbanization, per capita income, and social distance as measured by religious differences.

Some recent models focus on individual behavior and on the perceptions and decision-making process of the migrant. Everett S. Lee proposed a category of personal elements that includes age, education, sex, and race, added to factors that are associated with the area of origin, the area of destination, and intervening obstacles (1966). In Figure 1, pluses represent factors that hold and draw people, minuses factors that repel or push people from the area, and zeros characteristics toward which people are indifferent. The effects of these forces vary according to personal qualities of the potential migrant.

Cost-benefit models in their simplest form assume that a person migrates if earnings, over a period of time, are greater at the place of destination than they would be at

Origin
factors

Intervening obstacles

Destination
factors

SOURCE: Lee, 1966, fig. 1; reprinted by permission.

the place of origin, minus the cost of moving. Costs and benefits, except where they are only monetary as in the basic model, are difficult to identify and measure. Models in the field of economics often include internal migration as a component, and adaptations of the cost-benefit concept, such as that developed by Michael P. Todaro (1971; 1976), have been useful in studying rural-urban migration in developing countries. In the basic Todaro economic model, rural-urban migration depends on the probability that an urban laborer can successfully find a modern-sector job as well as on the urban-rural income differential. Migration is then a response to expected rather than actual earnings. John Harris and Todaro extended this model to incorporate a two-sector internal trade model of migration and unemployment. The Harris-Todaro extension gives explicit attention to the impact of migration on rural incomes, urban and rural output, and social welfare (Todaro, 1976).

People are not homogeneous with respect to mobility, and the redistribution of the population is largely a result of some people, habitual movers, changing residence repeatedly. The probability of migration can differ according to three mobility profiles: (1) chronic movers with a high degree of frequent and repeated mobility, (2) movers with a low degree of mobility over time, and (3) stayers with little or no mobility over time (Shaw, 1975). This mover-stayer concept has been developed using the methods of matrix algebra, with matrix-transition models that project the redistribution of a population over a period of time.

A related idea is expressed as the "law of cumulative inertia" (McGinnis, 1968), an assumption that the propensity to move declines as duration of residence increases. Because the probability of moving also varies with age, sex, life-cycle stage, and home ownership, the size of such models can become quite cumbersome.

Individual propensity to move may also be related to "place utility" (costs and benefits derived from a location), the stress experienced there, and the individual's "stress threshold" (Wolpert, 1966). The decision to move or stay may be conditioned by "awareness space," a term used to refer to the potential migrant's knowledge of opportunities available at other locations.

The process of decision making in three stages (development of desire to consider moving, search for an alternative location, and evaluation and decision to move) has been elaborated and mathematically specified (Speare, Goldenstein, and Frey, 1975). This model combines stress-threshold and cost-benefit concepts to express the decision to move as a function of the relative satisfaction with residence at the place of origin, the expected level of satisfaction at the destination, and the anticipated costs of moving. Each of these variables is determined by characteristics of the individual, the household, and the location.

One group of models is based on life table methods. The expectation of the number of moves a person will make at specific ages during his or her remaining lifetime is similar to the concept of expectation of life at specific ages as a measure of mortality [see LIFE TABLES]. The model uses a base population and the number of migrants (specified by age and sex) to calculate migration rates and the average number of moves expected per person. Mortality is taken into consideration as well as specific types of migrations, and the method can be applied to population subgroups. The model multiregional life table concept, introduced by Andrei Rogers (1975), combines the mortality and mobility experiences of several regions. Life table functions then include survival probabilities, probabilities of out-migration to all other regions, death rates, and out-migration rates from each region. This method permits estimation of internal migration from incomplete data. For example, with certain assumptions about mortality and migration trends, it is possible to use data on age, place of birth, and place of residence from one census to estimate lifetime rural-urban migration for other censuses where such data are not available.

Current work on predictions of migration extends the matrix-transition application to account for heterogeneity of population and multiplicity of causal factors. When concepts such as duration of residence are introduced, the assumptions of Markov chain analysis (that only location and no past events affect probabilities of transition, and that the system is closed to external forces) must be relaxed. A semi-Markov model developed by Ralph B. Ginsberg (1971, 1972a, 1972b) to allow for the influence of cumulative inertia is one of several approaches to the incorporation of a number of variables as components of a probabilistic model (Shaw, 1975).

One summary classification distinguishes two types of models, terming one group "macroanalytic" in orientation and the other "microanalytic" (Morrison, 1973).

The macroanalytic models focus on the ecological determinants of population flows, like size and distance. The microanalytic models focus on individual behavior and social and psychological determinants of immobility as well as of mobility. It remains now to integrate the two in models that allow for the interaction of those influences in a context of economic development and social change.

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3.
EFFECTS

The effects of internal, rural-to-urban migration on the migrants and on the rural communities they leave behind vary according to the type of migrant, the volume of migration, and the nature of the places involved.

Effects on Migrants. Interviews of rural-urban migrants find them to be satisfied with their new lives, reporting that life is better in the city than it was in their home communities. Satisfaction depends on changes in employment and income status and in educational opportunities for children, although improvements in housing, water and electricity services, and nutrition may also influence their attitudes. Although real income for the migrant families may not be significantly higher than it was at their place of origin, hopes for their children's futures tend to be brighter.

Some migrants are more satisfied with their new lives than others are, and part of this difference lies in the characteristics of the migrants themselves. The satisfied are more likely to be prepared for urban life and are more employable by virtue of age, education, experience, contacts, risk-taking ability, perseverance, or other qualities. They are able to find jobs and gradually improve their standard of living above that experienced prior to migration, in some instances above that of native-born city dwellers of comparable class. In short, such migrants are upwardly mobile. By contrast, less mobile migrants lack the characteristics that make them employable and achieve little or no improvement in their living standard. Indeed, some may be downwardly mobile, going from bad to worse.

Economic effects. The majority of studies of effects on migrants focus on the economic consequences of migration. In Chile, Colombia, India, Indonesia, Mexico, Nigeria, and other countries many migrants claim to have improved their real income and employment status as a result of migration, although usually not as much as they had expected (Findley, 1977). Migrants who are as well off or better than natives at the place of destination are often positively selected relative to the population at the place of origin. A "positively selected" person is defined here as one who possesses more of certain characteristics than the average for the population. Generally, such characteristics include education, income, occupation, and social status. Such persons may be better educated and able to earn a higher income than the native urban population, after accounting for differences in age and sex. Additional migrant characteristics associated with upward economic mobility are youthfulness and a greater propensity to take risks.

If defined as a shift from unemployed to employed

status, economic mobility is most probable for the better educated and less impoverished. Chilean migrants to Santiago, for example, were found to have achieved employment rates and statuses comparable to natives of Santiago, when differences for age and education were taken into account (Herrick, 1965). Before moving to Santiago, 35 percent of the migrants were unemployed or unpaid family workers, but only 3 percent were unemployed shortly after arriving. Economic activity among migrant women increased from 19 percent at the place of origin to 31 percent in Santiago.

Economic mobility is also reflected in income gains. Migrants in street occupations in Jakarta, for example, improved their daily earnings an average increase of 160 percent, while the more mobile migrants, for example pedicab drivers, increased their earnings by an average of 233 percent. Even after accounting for differences in cost of living, these migrants were better off than they had been as rural poor (Papanek, 1975). Not only does migration increase the amount of income earned, but it increases the chances that an individual can raise his or her income substantially.

For most rural-urban migrants, migration entails an occupational change from agricultural to nonagricultural work. The majority, 50 to 75 percent, work in the cities as unskilled or semiskilled laborers, often as construction or transportation workers. The next-largest group of migrants, among them many women, constitute the 25 to 35 percent of the migrant labor force in sales and service, including domestic service. This group includes migrants who have friends to vouch for them so they can set themselves up as vendors. Approximately 15 to 25 percent of migrants join the elite of professional, managerial, or clerical workers. With the exception of migrants to large Latin American cities very few of the white-collar workers are women. Although there may be sex-related differences, these occupation distributions typify the lot of migrants in Africa, Asia, and Latin America.

While precise figures are difficult to find on the proportion of migrants who make little or no real economic gain, available figures suggest that about one-fourth of all migrants fail to improve themselves. Primarily unskilled workers, these include migrants who remain unemployed from four to twelve months after moving. Study of this group is hampered by the fact that many of them give up and return to their place of origin or move on to try their luck elsewhere, if they can scrape together the cash for a move. In Cebu and Cagayan, Philippines, many Iban migrants cannot afford to return, despite their disillusionment with the city (Sutlive, 1977).

One of the most striking characteristics of less mobile migrants is the instability of their income. A report on the urban poor of Jakarta noted that only one-quarter of male migrants succeeded in finding a job paid on a monthly basis (Papanek, 1975). Of those with no schooling, 86 percent worked on a daily basis. Studies in LaPaz, Manila, Mexico City, and San Salvador showed that less mobile, less educated migrants tended to have less stable incomes and were forced to take any available earning opportunities, often by creating jobs like scavenging or hauling.

In countries where women move to cities, their experiences are likely to differ from those of men, partially as a result of sex-role discrimination but also because women are generally less well educated than men. Women migrants are less likely to have economic mobility, especially if they are single heads of households.

When they move into town, many Latin American and Southeast Asian women enter the labor force for the first time. Because they are generally less educated and saddled with additional responsibilities for housework and child care, they are often limited to part-time or self-employed work as vendors or casual laborers. In Popayan, Colombia, 56 percent of the migrant women engage in small-scale commerce (Whiteford, 1978). In contrast, migrant women in the Near East, Africa, and India generally do not enter the paid urban labor force, although they may undertake income-generating activities in their own home.

Consequences. There is no clear line dividing social from economic factors, but "social consequences" are defined here as changes in the migrant's social network, interaction pattern, and attitudes. These may include changes in family roles and in relations with neighbors and other individuals. For rural-urban migrants, the most dramatic social changes are those involved in shifting from a rural to an urban life style. Urban-urban migrants may also experience change, though it may relate more to resettlement.

Friends and kin provide substantial assistance to migrants. They make loans in cash or in kind to tide the migrants over until they find their own source of income, help them find a place to live, and assist them to become involved in the city's social life, easing the transition from rural to urban customs and, perhaps most important, helping new arrivals find jobs. Clubs and kin networks are prominent features of urban Africa and Latin America. Contacts developed among club members are very important for subsequent economic mobility. The presence and aid of kin are critical to migrant satisfaction with their new life.

The separation from kin left behind may have the greatest impact on young married women. At the same time they lose the social companionship of their home community, their responsibilities increase. Food prepara-

tion and housekeeping chores previously shared among female kin become the sole responsibility of migrant women. In addition, the shift to a money economy requires them to spend more time marketing away from home. They may also have to work for additional income to supply family necessities previously derived from farming.

Women migrants have evolved a number of techniques for coping with the demands upon their time. First, as in Africa, they may join or set up social and economic associations, which provide such diverse services as personal loans, cooperative purchase of goods for sale, or shared child care. Second, they may take work into their homes. Although this often relegates women to low-paying piecework tasks, it allows flexible scheduling and is more compatible with a dual mother-worker role. Third, women often find part-time jobs as vendors, where children may accompany and even assist them. Fourth, they may rely heavily on neighbors for assistance, either financially or for child care. In a Mexico City shantytown, for example, migrant women form reciprocal-exchange networks in which they incur debts of money or assistance during their economic "down" times, while they provide assistance to others when times are better. Most exchange networks are made up of kin who live within the same area of the shantytown, but neighbors may also participate (Lomnitz, 1977).

Many women migrants are single heads of households. While this status is a serious disadvantage to women who stay in the countryside and who rely on men for heavy farm work, single women with children find that their lives are better in the city, as in San Salvador, for example (Nieves, 1979). In some instances they are more easily employable than men and can support themselves better than if they relied on an unstable income from a male partner. In others, a better life results from development of more flexible household arrangements, with other female kin sharing child care and support.

The more educated women seem to cope better with the rural-urban transition in responsibilities and roles. This may be because educated women in urban areas participate more equally in family decision making and receive more assistance or cooperation in meeting the dual demands of worker and housewife. More important is the greater opportunity for semiskilled, skilled, or white-collar jobs, which allow the educated woman to buy the services or goods she would otherwise have to provide herself (Harkess, 1973).

Universal goals of migrants are finding work and shelter. Depending on the type of work undertaken, these goals are mutually dependent, as, for example, for women looking for work as domestics in Latin American cities. In a Libyan city, migrants are not considered

stable or worthy of a regular job until they have established their families in a home in the city. Thus even if jobs and housing are not directly related, there may be an implicit and important connection between the two.

For most migrants, the search for employment is facilitated by settlement near job opportunities. In most African, Asian, and Latin American cities this means a central city "bridgehead" from which to launch job-seeking activities. Although the central city is well suited for job hunting, it usually has a limited supply of housing and the costs are substantially higher than in the less centrally located shantytowns. Given the housing scarcity in most cities, many migrants can go only to shantytowns where kin can provide them with shelter.

One method of coping with life in the city is to minimize housing expenditures. For many migrants this means squatting, throwing up a shack on a piece of land without purchase or payment of rent. The owner of the land, generally a government entity, tolerates squatters and their shacks until the land is needed for other purposes. Other shantytown dwellers pay minimal rent for the privilege of using one room or a corner of a lot. Most shantytown residents are not squatters because they rent or own the land they occupy.

While the proportion of a city's population in squatter settlements may range from 15 to 50 percent, not all squatters are migrants. The latter are dispersed throughout the squatter settlements according to their acquaintance with persons already living there, their information about available squatting sites, and their ability to afford living in alternative locations.

Squatting allows migrants with extremely low and unstable incomes to spend almost no money for housing, leaving their limited resources for food and other necessities. Among those migrants with a higher and more stable income, squatting offers opportunities for consolidating and improving social and economic security. While continuing to benefit from zero land rents, these more successful migrants may use their housing as an additional asset to improve their further income levels. The house may be used as a place of business, or it may be enlarged and rented in part to another family. Though many squatters are still in areas susceptible to slum clearance programs, some governments are beginning to grant title to squatters, making the potential gains more certain.

Squatter communities vary widely in the level of services offered to residents. The poorest settlements lack roads, drainage, water or sewage services, and electricity. By Western standards, these conditions seem appalling, but in comparison with rural areas of developing countries the overall quality of housing and community services may be higher. Recent surveys of conditions in squat-

ter settlements show that many of the communities have some services. This is largely a result of squatter self-help efforts to provide themselves with transportation, water, and electricity, without costly reliance on outside sources.

Effects on Places of Origin. Unlike migrants who move from one urban area to another, migrants leaving rural areas are not generally replaced by other migrants. In the rural areas this loss of people and their potential contributions affects the dependency ratio (the number of economic dependents per 100 productive persons), rates of unemployment and underemployment, levels of human capital, and potential for innovation. At the same time, migrants may stimulate change within rural areas by creating new linkages or introducing innovations.

Population effects. Out-migration from a rural area reduces its population and may be effective in alleviating overcrowding. The effects on the residual population depend largely upon the numbers and characteristics of the people who leave. If only a small proportion of the population departs, density may be maintained by high birth rates. This situation is likely if only males migrate, leaving women and children behind.

The age and sex structure of the out-migrants determines the degree to which migration produces a drop in the birth rate. If young men leave but return frequently for visits, the birth rate may not drop because the return visits allow couples to maintain sexual relations, albeit more infrequently. If, however, the visits are infrequent, the birth rate may decline significantly, as has been observed in India, New Guinea, and parts of West Africa (Connell et al., 1976). If young couples leave at the peak of their childbearing years, the community's birth rate may fall, as it would if young single women migrated without replacement by women marrying in from other villages.

Even if birth rates are unaltered by migration, average family size will decline. There will be fewer adolescents or adults in each household. In addition, larger households are more likely to have lost someone than smaller households in which members cannot be spared. In one rural area of Mexico, migration was not undertaken unless there were at least three adults in the household. As a result, there were fewer large households after migration (Weist, 1973).

Changes in the community's age-sex structure will affect the dependency ratio. Everywhere young persons dominate among the rural out-migrants. When young working persons leave an area, the ratio of dependents to workers rises, particularly if there is no accompanying drop in birth rates. This means that the income of the remaining workers must support more persons. Only migration of the elderly or the young reduces the de-

pendency load, and these groups are least likely to migrate.

An often forgotten population change associated with rural out-migration is an elevated probability of migration for those remaining in the community. Studies in India, Argentina, Mexico, and Nicaragua show that villages with a history of migration are much more likely to have current migrants than low-migration villages. Just as migrants go predominantly to the destinations favored by prior migrants, certain villages will tend to send out more migrants than others.

Most contacts between migrants and friends or kin at their place of origin stress the good side of life at the place of destination. Migrants tend to visit on special occasions, wear their best clothes, and deliver whatever gifts they can while home. This appearance of prosperity tends to reinforce their relatives' beliefs that life is better in the city. Migrants are generally respected, and this respect may be transformed into the desire of those at home to migrate and share in the "good" life.

When migrants from a village go to a variety of cities, the villagers become aware of alternative destinations. People with knowledge of several urban places are likely to go a longer distance to the best or largest city. In the end, the dispersal of migrants to different cities broadens the migration options available to the youth "back home," increasing the chances that they will migrate.

Economic effects. If the migrant was unemployed prior to leaving the village, unemployment rates may fall; but if the migrant was a student or not in the labor force, there will be no observable change in unemployment levels. Similarly, changes in per capita income or productivity levels depend on the contributions of the migrant before and after moving and on the household's immediate and long-term responses to migration. In short, employment and income changes stemming from migration cannot be predicted in any simplistic fashion.

Study of the rural impacts of out-migration shows that it can result in productivity increases for the remaining workers only if such migration removes redundant labor, causes remaining workers to intensify their labor, or induces technological change in response to changing labor-force conditions. Little evidence has been found that such responses have been occurring in developing countries. Lack of demand for rural products and inadequate farm skills have prevented work intensification or technological change from occurring. While in some instances migration removes redundant labor and results in a drop in underemployment, more often there is no change because high rates of population growth continually add more workers to replace those who leave.

If anything, agricultural productivity may decline

after substantial numbers of persons have left. When men leave without returning to perform the tilling and clearing of fields, for which they are responsible, productivity will fall as soils are reused without the fallow period made possible by rotation to newly cleared areas. Fewer men at plowing time has caused planting delays into less favorable times, resulting in reduction of yields. In Zambia, women have been forced to quit farming because they could not find men to perform certain essential tasks (Cliffe, 1978). Similar productivity losses because of a shortage of labor at peak seasonal periods have been observed in Colombia and elsewhere.

In some instances, communities modified their farming practices to compensate for the loss of labor. The most frequent technique utilized is use of remittance income to hire casual workers needed at peak seasonal periods. In India, Mexico, and Nigeria, households surveyed reported that they preferred to purchase substitutes for the migrant because the migrant's earnings more than pay for the infrequent and inexpensive labor used to replace his services. An alternative to hiring seasonal labor is to rely more on help from kin, as for example in the Philippines where those remaining have banded together in work groups for plowing one another's fields. Other techniques adopted to compensate for labor loss are a shift to less labor-intensive practices and adoption of new seeds that are less sensitive to early or late planting, thereby extending the plowing and planting periods and reducing the seasonality of labor demands (Connell et al., 1976).

Because the persons most likely to leave a village are those with education, skills, and ambition, the village loses potential for innovation with the loss of the migrants. This loss further handicaps efforts to introduce new production techniques. On the other hand, returnees may bring back new ideas. In India, substantial numbers of short-distance movers over age 35 who have returned to their villages have played a major role in accelerating the introduction of nontraditional concepts. Circular rural-urban migrants in the New Hebrides have been instrumental in spreading a conversion to coffee crops (Connell et al., 1976). Studies of return migration, however, show such innovative returnees to be the minority. Studies in Ghana, New Guinea, Mexico, Pakistan, and Peru show that most returnees are the less selective, unsuccessful migrants (Findley, 1977). Even though these returnees may be better educated than rural nonmigrants, their urban skills, experiences, and resources do not facilitate adoption of agricultural innovations.

One handicap to rural development has been poor transportation between rural and urban markets. Migrants engaged in trade often rely on their home communities to supply goods for market, thereby stimulating increased production of those goods for sale. Migrant remittances also stimulate trade, because a large portion of remittance income usually goes for purchase of consumption goods. Finally, migrants may retire early to their home communities to establish themselves in a trade or small industry.

Changes in women's economic roles. Where men migrate without their families, migration produces major economic changes for the women left behind. The most outstanding change is more work. Studies in many countries document the increase in farm or wage-earning responsibilities undertaken by wives of absent husbands. These changes are most pronounced among the poorer women for whom migrant remittances may be extremely limited. As the mother takes on more farm or off-farm work, her children are asked to absorb more of the household responsibilities, reducing the time they might otherwise be able to devote to school. In addition, the household's shortage of workers makes impossible the fulfilling of communal labor obligations.

Women who assume responsibility for managing the family farm often find they are handicapped in any attempts to increase productivity. Despite a demonstrated willingness and ability on the part of the women to use innovations correctly, extension and loan agents generally do not work with them. Where migration is an option, migrant "widows" who can no longer cope will themselves move to the city.

Remittances. Remittances, or the flow of funds back into the village, represent a return on the education provided migrants. This income flow also links migrants with the people back home.

Studies show that remittances can constitute a fairly large share of the income of the family in the migrant's place of origin. Remittances ranging from 25 to 50 percent of the migrant's earnings have been found in Pakistan, Mexico, Kenya, Cameroon, Uganda, and Nepal. Even larger contributions were made by international migrants, particularly when they sent money back to purchase land. In Ghana and Kenya the volume of money flowing out of urban areas ranged from 10 to 20 percent of the migrant's income (Findley, 1977; Connell et al., 1976).

The number of households affected is fairly substantial. Surveys in Nepal and India show that one half to two-thirds of all rural households receive remittances. One-twelfth of rural households in Ghana were found to have received a majority of their cash income from remittances.

Rural families use this cash primarily for necessities, although a few use it for school fees. Poorer households

are often dependent on remittances, despite their uncertainty or meager amounts. Although intermittent or uncertain remittances may not be invested, the purchase of consumer goods may stimulate trade.

Longer-term remittances, especially those from international migrants, may be used to purchase land, housing, and farm machinery or other aids to agriculture (Stark, 1978). This is illustrated by the widespread use of international remittance income for purchase of tube wells in Pakistan. However, only well-off households have enough income to divert some of the remittances to major investments.

Especially in Africa, remittances are chiefly used to keep options open for the migrants' return. They are rarely invested in productive activities. Rather, they function as insurance premiums to protect the migrant in case of failure, illness, or other problems. This suggests that remittances do not have a significant impact on rural productivity levels.

Social effects. When people leave a community, the social fabric of the community inevitably changes. Although the exact nature of the changes may vary, outmigration tends to result in a greater integration of the village with outside communities. The remaining villagers will know more about urban ways and will be more likely to adopt selected urban behaviors, especially the purchase of urban consumption goods and the desire for formal education.

Several mechanisms result in a heightened demand for education. Where the more successful migrants are educated, their home visits only strengthen the demand for rural schooling. In addition, remittances from educated migrants are often viewed as paying off their debts to parents who paid for the migrants' schooling. Also, remittances are often used to pay siblings' school fees, increasing the effective demand for education.

Where parents have little land to pass on to their children, a popular and eminently acceptable alternative means of equipping children for adulthood is provision of an education, so that they may move to town and find a secure job. In a densely settled area of western Kenya where farms average two to three acres and families have several sons, the education-for-migration strategy is common (Moock, 1973). Needless to say, return visits of successful migrants only strengthen the parents' conviction that this strategy is preferred, so much so that they may resist attempts to make school curricula more farm-oriented.

Migration increasingly involves the community in the cash economy, and this involvement has several consequences for social structure. A shortage of labor may combine with remittance income to spell the end of communal labor exchange. Because communal labor ex-

changes also maintain ties among the community's kin groups, their demise weakens lineage ties. Cash rather than in-kind bride-price payments are said to produce the same effects in India. Communal ties are further weakened by the adoption of prestige behavior based on consumption of urban goods rather than trade of services or produce.

There is evidence that migration exacerbates socioeconomic inequalities. The poor are less likely to migrate, and when they do their remittances are minimal, going for necessities and not the purchase of urban goods. On the other hand, the better off migrate more frequently, and they are more likely to send back substantial remittances in cash or kind. Attendant on this increasing economic inequality is greater social and political inequality. Among the Riff in Morocco (Amersfoort, 1978) and Tzintzuntzanos in Mexico (Kemper and Foster, 1975), migration has resulted in increasingly visible social and economic differentiation between the "haves" and "have nots."

Migration-induced changes to village family structure or social networks suggest substantial modification of traditional patterns. Women left behind by male migrants in Colombia, Kenya, Mexico, and Zambia assume responsibility for many decisions previously reserved exclusively for men.

Neither are children immune to the social consequences of migration. With family or clan members residing in more than one locality, it is possible for families to relocate children as the need arises, as for example, if a migrant brother needs assistance for a few months or if a mother cannot care for her children while working at a particular job. Commonly, children are sent to town where they live with relatives while attending school. While the full ramifications of frequent childhood moves have yet to be explored, it seems likely that such mobility alters the child's perception of its place in the world. Where families have members living in both urban and rural areas, their social networks expand to include persons in both areas. This bridging facilitates cultural diffusion from city to countryside. The resulting diversity may enhance a family's flexibility in coping with the ups and downs of life.

Evaluation of Effects of Migration. The major impact of migration in the developing world, as in the developed world, has been concentrated in the largest cities. The growth of these cities has sometimes been four times as fast as the national average. Not all of this growth has been the result of migration. Nonetheless, it has resulted, in the short-run, in unemployment and underemployment, in strains on the housing and service delivery systems, and in government budget deficits.

Despite these problems, migrants have developed

numerous innovations and self-help systems, which assist the cities in coping with the influx. Migrants have shown an aptitude for labor-intensive technologies in the urban environment. This, together with their pressure to create more jobs, may have resulted in the current de-emphasis of capital-intensive industries. If this leads to improved matching of employment generation with employment demands in both urban and rural sectors, then migration may indirectly serve long-range goals for national development.

In the long run, rural out-migration theoretically can reduce population pressure and enhance labor productivity, incomes, and rural welfare. But in the short run, these changes seldom have been observed. Incomes and productivity generally have failed to rise, and in some instances they have fallen. Income inequality and class differentiation have been exacerbated. The departures of better-educated migrants have deprived rural areas of their education investments and innovative capabilities, while the migrants' remittances and contributions as returnees do not compensate for the losses.

Given the constrained opportunities confronting individuals in rural areas of most developing countries, there is no doubt that the migrants have chosen well and made good use of the available resources. Migration clearly entails some negative consequences for individuals, families, and communities; but for those who move it seems the best and perhaps only means to attain their goals, whether these be subsistence or economic mobility. Collectively their successes, however small, have contributed to national development.

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See also FERTILITY AND MIGRATION; LABOR FORCE; MIGRATION.

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4.
UNITED STATES

The United States is a land of movers. Since the founding of the country, internal migration has played a significant role in its economic and social development. This article discusses effects of internal migration and provides definitions of internal migration, statistical sources for measuring it in the United States, and information on the volume and patterns of U.S. internal migration.

Effects of Internal Migration. How many people move within a country's borders can be an important indicator of life styles and national character. Under some circumstances, a high rate of geographical mobility can indicate a strong commitment of the population to occupational mobility and personal career advancement. Extensive movement can enhance a nation's economic output and productivity as the labor force quickly responds to technological change by moving to areas where shortages of specific skills develop. The result may be to encourage economic growth, to develop a fluid social structure, and to create a degree of cultural uniformity in the different regions of the country. This last condition is not only the product of extensive past migrations but also an encouragement to further migration. All of these outcomes, however, may be at the expense of strong ties to neighborhoods, localities, and extended-family and kin networks.

Where these movers go affects more than just population increase or decrease in individual localities; the effects of migration on individual cities and towns can be quite varied. A large influx of low-skilled job seekers can put obvious strains on an area's economy and service institutions; and while an in-migration of affluent new residents can bring prosperity to a community, it can also bring increased demands for extension of services such as schools for children, roads to handle increased traffic, and municipal police and fire protection. Similarly, sustained out-migration may have positive effects through

reducing unemployment as excess labor is removed; but sustained out-migration can also diminish an area's human capital and even its ability to reproduce itself, for out-migrants are often persons in the reproductive years. Moreover, as the fertility of the United States has hovered near replacement levels for several years, one area's gain in population is often another area's loss.

The impacts of migration may be manifested at the national level, the regional level, and the local level. The magnitude of these impacts depends upon how many people are moving, where they are going, and the characteristics and motivations of those in the various migration streams. For the United States, censuses and surveys are the primary data sources on the total volume of internal migration, the detailed origins and destinations of movers, and a wide range of demographic, economic, and social characteristics of various groups of migrants and nonmigrants.

Definitions. There is no universally accepted definition of "internal migration." Many demographers contrast migration with local residential changes that, though involving a move from one dwelling to another within the local area, do not entail a complete disruption of daily activities such as commuting or going shopping. According to this concept, movement within a community (however "community" is defined) is not migration, and only movement from one community to another is to be considered migration. The theoretical basis for this perspective is that local moves are most commonly the result of life-cycle changes and housing adjustments, whereas migration often entails the search for employment or job relocations between labor markets.

This conceptualization is sometimes forced on researchers because the data systems of many countries count only moves across the boundaries of local administrative areas. In some European countries especially, individuals relocating from one local jurisdiction to another are required to register with the authorities in either or both the jurisdiction of departure and of arrival. Reflecting these considerations, the United Nations offers these definitions. "A migration is . . . operationally defined as a change of residence from one civil division to another, and the volume of migration is to a considerable degree a function of the size of areas chosen for comparison. A migrant is a person who has changed his usual place of residence from one migration-defining area to another (or who has moved some specified distance)" (1970, pp. 1–2).

These operational procedures characterize statistics on internal migration for many countries. In the United States data are often produced for movers between counties (of which there are about 3,100) and to and from metropolitan areas (which consist of at least one county

and include a city of at least 50,000 population and its surrounding suburbs). Either of these geographical entities (counties and metropolitan areas) might be considered "local areas" for purposes of defining migration. Strictly speaking, however, the United States has no official definition of what constitutes internal migration or who an internal migrant is. The U.S. Census Bureau endeavors to produce statistics on numerous types of moves, such as those that cross county or state boundaries, those that carry persons between metropolitan and nonmetropolitan locations, or those that carry persons from one geographical region to another.

All of these ways of stating the concept of migration are useful in one way or another. Counties and states are useful as a basis for defining migration because their relatively unchanging boundaries permit comparison of the level or amount of migration over long periods of time. As a basis for producing migration statistics, the metropolitan area concept has considerable analytical value, but since metropolitan area boundaries change over time, trend analyses are difficult.

Statistical Sources. For the United States there are three traditional sources of statistics on internal migration: (1) indirect estimates of net intercensal migration, (2) direct measures of gross migration from decennial censuses, and (3) survey questions on residential changes. Each has certain unique advantages, and the availability of each has strongly guided the kinds of questions that researchers have asked about migration within the United States.

Indirect estimates of net migration. One of the most valuable sources for analyzing migration within the United States over long periods of time is the set of intercensal estimates of net migration for individual states beginning in the nineteenth century (Lee et al., 1957; Kuznets, Miller, and Easterlin, 1960; Eldridge and Thomas, 1964). These data present a sweeping picture of outmigration from the low-income southern states that began before the Civil War, reached a peak in the 1940s, and then changes to net in-migration in the 1960s. The South's net in-migration grew considerably in the 1970s as economic conditions improved and as the warm climate and other amenities of the Sunbelt began to attract more persons.

This same data series documents net in-migration to the industrialized northeast from the nineteenth century to the 1970s when more persons began to leave the region than enter it. The North Central region, with a greater concentration of its economy in agriculture, received net in-migration during much of the nineteenth century but changed during the 1930s to net out-migration, a pattern that persisted through the 1970s.

The western region has experienced net in-migration

from the nineteenth century to the present, although its greatest volume of in-migration was in the 1940s and 1950s. Net in-migration to the West has been declining since the 1960s, and in the 1970s fell below that of the South.

Examination of net intercensal migration for states and regions from 1870 to 1950 showed that the total amount of population redistribution through migration was generally greater during periods of prosperity than during periods of economic depression, suggesting that while both "push" and "pull" forces entered into the migration decisions of individuals, the latter was the more important source of long-term population redistribution. Subsequent research has generally supported the theory that the pull of newly developing economic opportunities more effectively explains migration flows than the push that comes from the contraction of employment opportunities in areas of economic stagnation.

Historical data on net intercensal migration also showed that in spite of limited opportunities, southern blacks did not migrate in large numbers to other regions until the massive waves of foreign immigration were over. The net out-migration of blacks from the South rose greatly during the 1920s, when migration from Europe to America was sharply reduced. Black migration from the South declined during the economic depression of the 1930s and reached its greatest volume in the 1940s, 1950s, and 1960s. The data suggest that as long as immigrants were available for jobs in the industrializing North during the late nineteenth and early twentieth centuries, blacks generally stayed in the South. Under some circumstances, therefore, large-scale foreign immigration appears to reduce the volume of internal migration or at least acts to curtail some regional streams of migration that would have occurred in the absence of immigration.

Direct measures of gross migration from censuses. A second major source of data on internal migration comes from decennial censuses. Since 1850, censuses have asked respondents to report their state or foreign country of birth. Comparison of state of birth with state of residence indicates a fairly steady rate of lifetime interstate migration, with about three-fourths of the U.S. population living outside their state of birth at successive censuses. This rate fell slightly during the 1930s but quickly returned to its "normal" level after the Depression.

Another census measure of migration is a question asked in the 1940, 1960, 1970, and 1980 censuses of the form, "Did you live at this street address on this date five years ago?" Persons answering no were asked to name their county and city of residence five years earlier. These data have been of vital importance in documenting migration flows to and from individual states, metropolitan

areas, and regions, and have also documented intra-metropolitan movements (such as within a city and from cities to suburbs).

These data revealed a marked increase between the 1930s and the 1950s in the propensity of the American population to migrate between states. The percentage of Americans moving between states rose from 5.4 in 1935–1940 to 9.2 in 1955–1960—a 70 percent increase. The rate of interstate migration held relatively stable during the 1960s, being 9.3 percent in 1965–1970. There is some evidence that migration rates in the 1970s were beginning a modest decline.

As migration rates increased between the 1930s and the 1950s, so did the average distance moved. Census data on state of residence five years earlier were tabulated to show all state-to-state flows, and these data show that in 1935–1940 the average interstate move covered about 606 miles. By 1955–1960 the average interstate move was longer, covering 756 miles. (Moves to, from, and between Alaska and Hawaii are excluded.) By 1965–1970 the average interstate move was over a distance of 767 miles—hardly a change from that of the late 1950s, suggesting that the improvements in transportation and communication and other developments that reduced the "friction of distance" had reached a relative plateau. By 1970, therefore, neither the propensity to migrate between states nor the distance covered by such moves were rapidly increasing as they had earlier.

The development of gross migration data from censuses revealed another important aspect of migration within the United States: its "efficiency" over time was decreasing. Demographers sometimes measure the efficiency of internal migration by summing the volume of net in-migration to areas having net in-migration (or summing net out-migration for areas having net out-migration) and dividing by the gross amount of migration between the areas serving as the basis for measurement. Using states for this purpose, the efficiency of U.S. internal migration fell from 0.215 in 1935–1940, to 0.180 in 1955–1960, and to 0.116 in 1965–1970. These data mean that for every 1,000 persons moving between states in 1935–1940, there was a net redistribution of 215 persons, but by 1965–1970 every 1,000 persons moving between states yielded a net redistribution of only 116 persons. In this way, migration flows within the United States have come to be more nearly offsetting one another, and interstate streams and counterstreams are more nearly equal. Such data suggest a growing complexity of migration decisions and increasing difficulty in predicting an individual's migration, for declining efficiency of migration means that more and more persons have come to have reasons for moving to areas where others are leaving.

Migration data from sample surveys. To an increasing degree, knowledge about migration within the United States comes from sample surveys. These generally provide more current data than do censuses, and they have more flexibility for asking reasons for moving or for queries about attitudes toward past migration and expected future migration. Moreover, they can sometimes be made longitudinal, so that individuals can be traced and their characteristics measured both before and after a move has occurred.

Two of the largest surveys that collect migration data are the Current Population Survey and the Annual Housing Survey, both conducted by the Census Bureau. In a special supplement each March, the Current Population Survey asks respondents their place of residence one or five years earlier. This question is especially useful for monitoring the overall mobility of population and various subgroups (e.g., the low-income population, blacks and whites, families with children, etc.). The Annual Housing Survey inquires about a household's mobility during the preceding 12 months and collects data on reasons for moving and housing conditions preceding the move (e.g., whether the previous residence was owned or rented, whether it was a single-family house, the number of rooms in the previous residence, etc.). The results are published in statistical reports (U.S. Bureau of the Census, 1980; 1981) and in special studies issued from time to time.

Surveys have been an important means of establishing migration differentials, whereby some demographic groups are more prone than others to making residential changes. For most types of long-distance moves, the young, the better educated, and households with few children clearly predominate. After reaching a peak among persons in their early twenties, the propensity to move declines with age but shows a modest increase around age 65 and a sharper rise after 75 or 80. Through most of the labor-force years, when both the husband and wife work, couples are somewhat less migratory than households where there is only one earner. As more and more wives are committed not just to jobs but to careers, we may anticipate changes in decisions about migration, so that more couples decide not to relocate or to relocate only to places where both husband and wife can find suitable employment.

Recent surveys suggest an evolving set of reasons for moving. Most intrametropolitan movement continues to be the product of housing adjustments (of a voluntary or involuntary nature) and life-cycle changes like household formation and dissolution, the birth of children, and the aging of children through the years of school attendance. But reasons underlying the long-distance moves between states or metropolitan areas are undergoing change. Be-

cause of declining household size (the product of falling fertility, changes in living arrangements, and other factors) and composition, the incentive of households to maximize earnings through migration is probably declining. More persons are in a position to move or not to move on the basis of nonemployment considerations like a desire for a better climate, the availability of recreational opportunities, or simply a regional or size-of-place preference.

Surveys are also used increasingly to gauge these locational preferences. In the late 1960s a number of surveys uncovered an expressed preference on the part of large numbers of Americans to live in a nonmetropolitan setting away from large cities and their suburbs. The number of persons expressing such preferences far exceeded the number actually living in nonmetropolitan areas; and when migration patterns shifted around 1970 to favor nonmetropolitan areas, there was widespread speculation that such preferences were governing locational decisions of individuals to a substantial degree. In the future, migration desires and intentions will likely be analyzed through surveys in somewhat the same manner that fertility researchers rely on survey respondents to report their expectations regarding future childbearing.

Volume of Internal Migration. Nations vary considerably in the spatial mobility of their populations. Because different geographical units are used in different countries as the basis of measuring internal migration, exact international comparisons of the volume and rate of internal movement are difficult. A growing number of countries, however, are beginning to include in their censuses and surveys questions of a basic form, very similar to those in the United States: "Did you live in this residence on this date one year (or five years) ago?" The percent answering no gives an internationally comparable measure of total spatial mobility.

Data of this type serve to confirm long-held notions that Americans move around a great deal within their country, although Canadians and Australians are about as spatially mobile as Americans (Long and Boertlein, 1976). Over a one-year period, a little more than 19 percent of the populations of the United States, Canada, and Australia move, compared with annual residential mobility rates of 15.4 percent in New Zealand, 12.0 percent in Japan, 11.8 percent in Great Britain, 11.2 percent in Hungary, 10.4 percent in France, 10.0 percent in Taiwan, and 5.1 percent in Ireland.

The comparable five-year rates of moving are 47.0 percent in the United States, 46.6 percent in Canada, and 43.4 percent in Australia. In contrast, only 35 to 37 percent of the populations of Britain and Japan move in five years. Differences among countries in rates of internal geographical movement are less when measured over a five-year period than a one-year period because the longer interval increases the chance that the same individual will make more than one move, even though only one is counted by the census or survey question.

Other types of comparisons also suggest substantially higher rates of migration within the United States than in Europe. For example, the percent of the U.S. population moving across state lines in a year's time (close to 6 percent) is often higher than the percent of European population moving between spatial units more similar in size to U.S. counties than to states. In a sense, therefore, Americans are as prone to move from state to state as Europeans are to move from county to county. This higher rate of moving over longer distances strongly implies less attachment to place and a greater willingness (or need) for many Americans to live in a succession of communities over a lifetime.

Why Americans, Canadians, and Australians move around so much is probably attributable to several influences. For one thing, all three countries are immigrant nations that may have developed an ethos encouraging mobility as the result of a need to settle almost empty continents and successively advance a frontier. For another, all have developed a dispersed settlement system that has no primate city or clearly dominant metropolis serving as a mecca for spatially mobile and upwardly mobile persons. Instead of an urban system that draws migrants toward one center of commerce and cultural life, the United States, Canada, and Australia have numerous metropolitan centers that compete with one another for business, industry, and migrants. By competing with one another, these centers may keep high the amount of intermetropolitan migration. A high rate of intermetropolitan migration, in turn, tends to generate a high rate of intrametropolitan moving.

Size of country *per se* may not have as much influence on the rate of residential mobility or internal migration as might at first be supposed. Geographically small areas sometimes have rates of residential mobility as high as those found in the United States, Canada, and Australia. Hong Kong, a small, densely urbanized island-nation, has a residential mobility rate that is at least as high as that found in the United States, Canada, and Australia. Puerto Rico, a substantially rural but urbanizing island, has a five-year residential mobility rate that is slightly less but still higher than is generally found in Europe. These examples suggest that factors other than size of country account for the high rate of residential mobility in the United States. These other factors probably include many aspects of the total settlement system and its past development and probably also cultural influences that affect attitudes toward residential mobility and its effects.

The "Turnaround" in Nonmetropolitan Migration. Perhaps the most dramatic and unexpected change in migration patterns in the United States in recent decades was the "turnaround" in population growth in nonmetropolitan areas in the 1970s. Historically rural areas almost continuously have had net out-migration to urban areas, as young people left farms and small towns to go to the jobs and other attractions of cities and their suburbs. Throughout the 1970s, however, more persons moved from urban areas to rural areas than in the opposite direction.

This change in pattern was the result of fewer persons leaving nonmetropolitan areas as well as more persons moving to nonmetropolitan areas from cities and suburbs. In a sense, therefore, the new pattern entails both a back-to-the-countryside aspect and a stay-in-the-countryside aspect.

Thus the change is more than just a spillover of population from metropolitan areas into the adjacent countryside. Demographers have made a distinction between nonmetropolitan counties lying adjacent to metropolitan areas (and therefore likely to be recipients of any metropolitan spillover of population) and nonmetropolitan counties that are not adjacent to a metropolitan area. In the 1970s and earlier decades, the former group of counties grew more rapidly than the latter, but the latter showed the greater change in migration pattern, from net out-migration in the 1960s to net in-migration in the 1970s. This change in the direction of net migration for the relatively remote, nonadjacent counties is generally accepted as the basis for saying that a "turnaround" in migration occurred in nonmetropolitan America in the 1970s.

Because the turnaround persisted throughout the 1970–1980 decade, it should not be considered merely a short-term aberration of the long-standing trend for metropolitan areas to have net in-migration and to grow more rapidly in population than nonmetropolitan areas. No single explanation fully accounts for the change or forecasts its duration, but several developments suggest reasons for it. One is the continued decentralization of employment opportunities associated partly with the penetration of rural areas by the interstate highway system and the associated shift from rail to truck transportation.

Another factor in the turnaround is the growth of local government services in many rural areas, as reflected in the expansion in the number of local government employees outside metropolitan areas. Renewed energy extraction—from coal mining in Appalachia and the Rocky Mountain states to oil and gas exploration in other areas—has provided new jobs in nonmetropolitan areas. A fourth factor is the increase in retirement and recreational pursuits. As the retirement age has fallen and pension benefits have become more generous relative to earnings before retirement, larger numbers of persons enjoy greater "locational freedom" and have gravitated to nonmetropolitan settings because of their lower living costs and environmental qualities. For persons not of retirement age, the growth in leisure time, especially the institutionalization of the three-day weekend, has encouraged the pursuit of leisure in fairly remote rural locations. Finally, residential preferences and the perception of the relative quality of life in rural and urban settings may be changing so that more persons are opting to move to or to stay in nonmetropolitan areas.

The nonmetropolitan migration turnaround could itself be reversed by a prolonged energy crisis or other hard-to-predict events. A need to live closer to urban workplaces or a changed perception of urban life could someday produce a back-to-the-city trend that would bring about a centralization of some demographic groups. But the dominant migration patterns in the United States are bringing about population deconcentration in almost all aspects: a net redistribution of population from cities to suburbs, from metropolitan to nonmetropolitan areas, and from the more densely to the less densely settled regions. Only massive social and economic dislocations could reverse this migratory flow from the core to the periphery.

Larry H. Long

See also MIGRATION MEASUREMENT; URBANIZATION, *article on* DEVELOPED COUNTRIES. *For a discussion of sources of data, see* DATA COLLECTION, *articles on* NATIONAL SYSTEMS *and* UNITED STATES CENSUS.

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INTERNATIONAL CLASSIFICATION OF DISEASES

International Classification of Diseases (ICD) is a system of classification developed to furnish a basis for compiling quantitative data about groups of cases of various diseases in different population groups. Conditions of high incidence or significant morbidity are assigned individual code categories; others are grouped together, often by anatomical site or physiologic system.

The treatise *Nosologia Methodica,* written in the eighteenth century by François Bossier de Lacroix (known as Sauvages), is the first systematic classification of diseases. *Synopsis Nosologiae Methodicae,* published in 1785 by William Cullen, was the classification most commonly used in the beginning of the nineteenth century. William Farr, as the first medical statistician of the General Register Office of England and Wales, developed a disease classification by anatomical site (1837), which later became the basis for the International List of Causes of Death. The International Statistical Institute, in 1893, adopted the Bertillon Classification of Causes of Death developed by the French statistician Jacques Bertillon. Adoption of this classification in the United States, with the suggestion that it be revised every ten years, was accomplished at the 1898 meeting of the American Public Health Association.

The basis for the current ICD was established in August 1900 when the first International Conference for revision of the Bertillon Classification was convened in Paris by the French government, with twenty-six countries participating. Bertillon continued to be the guiding light for the 1900, 1910, and 1920 revisions. After his death in 1922, two agencies developed parallel classification systems: the International Statistical Institute and the Health Organization of the League of Nations. To coordinate the work of both agencies, the "Mixed Commission" was formed from the two, which then drafted proposals for the fourth and fifth revisions (1929 and 1938, respectively) of the International Classification of Causes of Death.

With the development of the sixth revision (1948), the future responsibility of the World Health Organization (WHO) Expert Committee on Health Statistics for revision of the classification was established. The Sixth Decennial Conference marked the beginning of other developments in the field of international vital and health statistics. This revision was the first to include nonfatal pathologies in the classification system. In addition to establishing international agreement on the classification process, a comprehensive program for cooperation and coordination of international statistics was developed. The Seventh Revision Conference was held under WHO auspices in February 1955.

The Eighth Revision Conference was convened by WHO in 1965, and extensive changes were made to permit greater specificity, but the basic structure and the philosophy of classifying a disease according to its etiology rather than a particular manifestation was retained. In 1975, the Ninth Revision Conference was convened; its changes came into effect in January 1979. Major innovations include optional fifth digits in certain places in the coding system to allow additional detail; optional dual classification of certain diagnostic statements to show manifestations in addition to traditional etiology codes; and classification of injuries according to their nature instead of their external cause. Six WHO centers have been established to assist countries in the use of the ICD; they are located in Paris, São Paulo, Moscow, Caracas, London, and the Washington, D.C., area.

In addition to its international application, the ICD has been adopted by individual countries in their statistical systems. The International Classification of Diseases, Adapted for Use in the United States (ICDA) is one such adaptation. A clinical modification of the ninth revision that adds extensive detail at the fifth-digit level will be used with U.S. morbidity data to enable full indexing of hospital records and detailed codes of clinical and diagnostic procedures.

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INTERNATIONAL MIGRATION

During the thirty-five years since the end of World War II, the single most notable characteristic of international migration trends has been their variability. Influenced by changing international political and economic relations as well as by internal conditions in both net sending and receiving countries, flows of international migrants have undergone marked shifts in direction, magnitude, and composition. Precise dates cannot be set, but it is nevertheless possible and useful to identify four broadly distinct phases of international migration during the period.

The predominant flows of the first phase, which extended from the end of World War II into the early 1950s, were a direct result of the war and the ensuing political settlements. During the second phase, which lasted until about 1960, the chief flows were a resumption of those that had typified much of the nineteenth and early twentieth centuries, movement out of Europe for resettlement in North and South America and in Oceania. Then, an important turning point occurred during the early 1960s, marking the beginning of the third phase. Europe as a whole ceased to be a region of net emigration and northern and western European countries began to attract a large net inflow of migrants from a number of less-developed countries. At roughly the same time, the traditional net receiving countries of North America and Oceania also began to draw increasing numbers of their immigrants from Africa, Asia, and Latin America. Finally in the fourth phase, beginning just before the middle of the 1970s, the large-scale flows of migrants into northern and western Europe were substantially reduced while new centers of immigration emerged, chiefly in the resource-rich countries of Western Asia and other individual countries within the less-developed regions.

The Late 1940s. The largest single stream of migrants was the roughly 12.5 million of German ethnic origin who, following the end of World War II hostilities, entered the zones that were later to become the Federal Republic of Germany (West Germany) or the German Democratic Republic (East Germany). Roughly half of these migrants came from the former eastern provinces of prewar Germany, whose ethnic German populations relocated west of the Oder-Neisse line. Another fourth were members of the German-speaking minority of prewar Czechoslovakia. The remainder came from Poland, Romania, the Soviet Union, and other countries. In all, these immigrants added something like one-fifth to the combined populations of the two German successor states; the impact was all the greater since nearly 10 million arrived during 1945–1946.

At the outset, the territory that was to become the Federal Republic of Germany received about 7 million refugee migrants while the future German Democratic Republic was the destination of some 3.5 million. During the decade that followed, ethnic Germans from other countries continued to flow into western Germany, but added to this was a substantial flow from eastern Germany, as well. By 1957, West Germany alone had absorbed a total of more than 12 million German immigrants; 9 million directly from outside and 3 million more from East Germany or through East Germany from outside. It appears that by the end of the period East Germany had experienced a net gain of about 1 million through immigration.

In addition to the migration of ethnic Germans into the successor German states, there were other important war-related movements within Europe. When the fighting finally stopped, millions of Europeans had been displaced from their countries of origin and many more moved in response to changed conditions immediately after the war. Of course, the same kinds of circumstances that forced people to migrate made accurate recording of their moves difficult. Moreover, some of the moves were on the conceptual borderline between internal and international migration; for example, when the western border of Poland was shifted westward, it is estimated that some two million Poles moved into the newly acquired territories. The moves were technically internal, although had they occurred earlier they would have involved the crossing of an international frontier.

The available evidence suggests that, in addition to the Germans, something like 7 million international migrants in Europe moved during the years directly following the war. The largest groups were the approximately 2.2 million returnees to Poland from the Soviet Union and other countries (most notably France and wartime Germany), some 600,000 who entered the Soviet Union (including Soviet citizens returning from wartime displacement plus Ukrainians, Byelorussians, and Lithuanians who had been prewar residents of Poland in the area west of the Curzon line), and approximately 500,000 returnees to Italy (about half from territories added to Yugoslavia and the rest from former colonies in Africa). Turkey, Czechoslovakia, and Hungary each experienced immigration of approximately 200,000 returnees. Austria apparently received a net inflow of about 300,000 during this period.

Outside of Europe, a major flow of migrants was associated with the establishment of the state of Israel, following the partition and the termination of the U.K. Mandate for Palestine, near the end of 1947. During the four years 1948–1951, the new state of Israel had an immigration flow of some 700,000. This inflow thus

made up the largest component of the population of Israel; the total Jewish population of Palestine at the beginning of 1946 had been 565,000. During 1948 and 1949, 60 percent of the immigrants into Israel originated in Europe, the largest numbers coming from Poland, Romania, and Bulgaria; others came from Turkey, the People's Democratic Republic of Yemen, Yemen Arab Republic, and the countries of North Africa. By 1950–1951, Europe was the source of just less than 40 percent of the total flow while 47 percent came from Asia, especially Iraq.

The settled Arab population of those territories of Palestine in 1945 that were to be included within the boundaries of Israel following the partition and the truce in 1948 was about 735,000. Taking into consideration natural increase, immigration, and the nomad population, 860,000 Arabs were estimated to have been within those boundaries by the end of 1947. As a result of the founding of the state of Israel, the great majority of this population moved to the neighboring countries. Given the very tense conditions that prevailed at the time, it was very difficult to determine with accuracy the numbers of Arabs who emigrated. It appears, however, that during 1948, about 750,000 fled while just over 110,000 remained. By 1951, there were 880,000 Palestinian refugees registered with the United Nations Relief and Works Agency: 465,000 in Jordan, 200,000 in the Gaza Strip (a part of prepartition Palestine, administered by Egypt from 1948 to 1967), 105,000 in Lebanon, 85,000 in Syria, and the remaining 25,000 in Israel itself. The demographic impact of the influx was particularly sharp in Jordan and in the Gaza Strip; their preexisting populations had been comparatively small so that Jordan grew as a result of the inflow of refugees by about 80 percent and the Gaza area by some 200 percent.

Substantial international migration directly linked to the end of World War II was also experienced in East Asia. Following the end of hostilities, Japan had a return flow of civilian and military repatriates of some 6.3 million added to the country's total population of 72 million in 1945. More than 80 percent of the returnees entered Japan during the eighteen months immediately following the armistice; by the end of 1948 the return movement was virtually completed.

Just over half of all Japanese repatriates were civilians returning from territories administered during the prewar years under some form of colonial status by Japan. The largest number, about 1.2 million, came from Manchuria (then known as Manchukuo and Dairen). There were 710,000 from the combined areas of North and South Korea (Chosen), 320,000 from the island of Taiwan (Formosa), and 275,000 from Sakhalin and the Kurile Islands.

In addition to the departure of the Japanese, there was a substantial amount of international movement of Koreans, as well. Between the end of hostilities in 1945 and 1948, according to government estimates some 2.2 million Koreans returned to the Republic of Korea (South Korea), chiefly from Japan and Manchuria. South Korea also estimated that more than 1.5 million persons had entered the country from the Korean People's Democratic Republic (North Korea) during the years before and during the Korean War.

The final major international flow of migrants of the early postwar period was the exchange of population that resulted from the partition of the Asian subcontinent along religious lines into the nations of India and Pakistan. During the years 1947 and 1948, approximately 6.7 million refugees moved in each direction between the two countries, some 13.4 million in all. The numbers moving tapered off somewhat after 1948 but by the mid-1950s a total of between 8.5 and 9 million appeared to have moved in each direction. Migrants continued to flow from Pakistan to India in the years that followed, probably on the order of 1.25 million throughout the 1950s.

The impact of the influx was very unevenly felt throughout the two nations. At the outset, there were about four "displaced persons" from Pakistan (then West Pakistan) to every one from Bangladesh (then East Pakistan) among the total who entered India. More than 60 percent of that total settled in just two Indian states, West Bengal and the Punjab. Of all the emigrants from India, less than 10 percent went to Bangladesh; more than two-thirds of all the refugees ("Muhajirs") from India went to the Punjab region of Pakistan.

In addition to the postwar flows of refugees and repatriates, a more traditional pattern of migration for resettlement resumed, with economic motivation at the microlevel as a predominant influence. Much of this migration was within northern and western Europe and to a small number of non-European countries. These flows were small when they recommenced in 1946, but they began to build up by the end of the decade.

During the first five years after the end of hostilities, the chief European countries involved in these flows were France, with a net immigration of some 350,000, the United Kingdom with about 175,000, and Sweden and Switzerland each with some 110,000; most of the immigrants came from other European countries. Leading European countries of net emigration in these flows were Italy and Spain, with losses of some 400,000 and 113,000, respectively. Major destinations outside of Europe were the United States, which had a net inflow of some 822,000; Canada with a net of 430,000; Australia 350,000; and Argentina 382,000. Several countries in Africa at-

tracted substantial numbers of migrant workers, mostly from neighboring countries. During this period, Ghana (then Gold Coast) had a stock of some 200,000 foreign-born and Zimbabwe (then Southern Rhodesia) had about 250,000. In South Africa there were approximately 606,000 foreign-born in 1951, with over 200,000 foreign workers in the mining industry alone.

The flows of migrants not directly associated with postwar readjustment were dwarfed by the streams of repatriates and refugees. It is, of course, impossible to produce a precise estimate of the latter, but it is probably safe to say that more than 50 million people were involved around the world. There has been a good deal of discussion of the economic and social consequences. Of West Germany and Japan, it has been suggested that the repatriates contributed significantly to economic recovery, once the initial shock of their arrival was over. On the other hand, for India and Pakistan the refugee influx has been viewed as a long-term impediment to economic recovery and growth. The long-run economic consequences in general remain undetermined. One sociopolitical consequence appears unambiguous, however. The net effect in most instances was an increase in the homogeneity—ethnic, religious, and linguistic—of the nations involved. As an immediate aftermath of the war, populations that had been dispersed and intermingled tended to reconcentrate themselves.

The 1950s. International migration during the 1950s was on a comparatively smaller scale than in the phase of recovery from World War II and was predominantly a movement of individuals for long-term resettlement. Leading flows were from Europe to North and South America and to Oceania. In many ways the migration during this period of relative lull resembled the patterns that prevailed throughout much of the nineteenth and the early twentieth centuries.

The United States received the largest net inflow of migrants in absolute terms. During the course of the decade the country experienced a net gain of population from migration of just less than 3 million. Canada received 1.1 million and Australia some 830,000. Of course, the relative weight of the inflow was much greater for Canada and Australia, whose total populations were about 15.5 and 9.2 million, respectively, midway through the decade, while the United States had a total of 166 million. In Latin America, Argentina had a net inflow of about 350,000, chiefly from Italy and Spain, while Brazil received about the same number, mostly from Portugal. Venezuela appears to have received more than 400,000 immigrants, again largely from southern Europe. In Europe itself, the countries with the largest net immigration streams were West Germany and France. Most of the migrants to West Germany, especially in the earlier years

of the decade, came from East Germany, as previously described. France resumed its historic role as a leading European country of net immigration, with a net inflow of about 1 million during the decade. Switzerland and Sweden had net inflows of some 300,000 and 100,000 respectively. Migration into Israel slackened from its earlier high levels and during all but the first two years of the 1950s averaged about 35,000 per year, with a notable peak in 1956–1957.

The leading countries of emigration were those of southern Europe, with an aggregate net outflow of 3.5 million, plus Ireland. Italy was the origin of some 1.2 million net migrants, Spain of 825,000, Portugal 650,000, Yugoslavia 600,000, and Greece 200,000. Net migration from Ireland was 400,000. There were some 170,000 emigrants from Japan, almost entirely to the United States or to Brazil.

Through the 1950s and during the following two decades as well, rates of international migration were consistently low in the countries of eastern Europe and in the Soviet Union, all with centrally planned economies, with the one notable exception of Yugoslavia. Exchanges of population within the region or with countries in other regions have been demographically insignificant, once the refugee and repatriation moves directly following World War II were completed.

During this second phase, there were sporadic outbursts of new refugee flows, although aggregate numbers were very much fewer than during the first years after the war and also somewhat less than the numbers of individual migrants resettling in a new country. The largest such movement took place in 1954–1955, when between 800,000 and 1 million refugees are believed to have moved from what was then the Democratic Republic of Vietnam (North Vietnam) to what was then the Republic of South Vietnam, following the partition and the Geneva Agreement. During the Korean War, there was a net flow of about 360,000 from North to South Korea. Beginning in 1958, there was an outflow from Cuba that eventually reached some 500,000, the majority to the United States. Hong Kong received a steady flow of about 40,000 per year from the People's Republic of China throughout the decade. In Europe, some 200,000 are estimated to have left Hungary around 1956. The Netherlands received a net influx of about 180,000 Dutch nationals and Indonesians during the decade, following the establishment of the Republic of Indonesia.

Near the end of the decade a pattern of movement that became predominant in the third phase began to appear. Flows from less-developed into more-developed countries began to increase. The United Kingdom and France received significant flows from countries that had been linked to them in the colonial era and for whom entry

was somewhat easier. In the United Kingdom, for example, more than 350,000 persons who had been born in certain countries of the New Commonwealth (mostly India, Pakistan, and Jamaica) entered during the 1950s. By 1954, some 300,000 Algerian workers were estimated to be in France. West Germany began to experience an inflow of foreign workers from 1957, mostly from Italy at the outset. Switzerland also began to draw in foreign workers during this period. In an analogous trend, the United States attracted increasing proportions of migrants from Latin America. During the first half of the period, 16 percent of the immigrants to the United States came from nations of Latin America, while during the second half, 28 percent of a larger total flow of immigrants originated in that region. In South Africa, the number of foreign workers recruited from other African countries continued, but apparently at a slightly lower level than during the preceding decade.

The 1960s and Early 1970s. The new patterns of migration that began to appear in the later 1950s became predominant in the decade and a half that followed. The leading flows came increasingly to be moves of people—the majority males—going from poorer to richer, more urban, industrial countries in search of employment. During this period international migration began to reflect quite directly the prevailing international economic order; the migration flows themselves became one of the factors linking more-developed and less-developed nations.

Through the 1960s and into the first half of the 1970s the traditional countries of immigration, North America and Oceania, continued to receive large and generally accelerating net inflows. The United States had net immigration of 5.1 million, Canada 2.1 million, Australia 2.7 million, and New Zealand 0.5 million. Moreover, the proportion of immigrants of European origin fell in all of these countries, as shown in Table 1.

In place of the Europeans, immigrants came from Latin America, Asia, and Africa.

The role of Latin America in the international flows of migrants shifted markedly around 1960. From having been a region of net immigration during the 1950s and before, Latin America began to experience substantial

net emigration. The previous large-scale flows from Italy were reduced to a trickle; the streams from Portugal and Spain did not decline as much, but they were less than half the size during the 1960s than a decade earlier.

The chief destination of migrants from Latin America was the United States. During the 1960s, some 1.3 million persons born in one or another of the Latin America nations were recorded by the United States as having entered as an immigrant. The largest numbers were from the countries of the Caribbean and the perimeter of the Gulf of Mexico, most notably Mexico, 440,000; Cuba, 250,000; the Dominican Republic, 90,000; Jamaica and Colombia, 70,000 each. The total inflow does not include migrants from Puerto Rico, who are not considered by the United States to be international migrants. (There was a net flow from Puerto Rico to the United States through the 1960s so that the population of Puerto Rican origin in the United States recorded in 1970 was 0.8 million. From the early 1970s, the net flow was reversed, with a slight balance in favor of return to Puerto Rico.)

There was also a substantial flow of migrants from the English-speaking countries of the Caribbean to Canada and to the United Kingdom. During the early 1960s, more than 125,000 migrants from the region entered the United Kingdom. The flow was restricted by the United Kingdom in 1962 and numbers moving declined sharply thereafter. Immigration into Canada from Latin America as a whole (mostly from the Caribbean) rose steeply during the later 1960s and early 1970s. For the years 1960–1964 Canada received only 16,000 migrants from the region. The numbers rose to 55,000 for 1965–1969 and 120,000 for 1970–1974.

Within Latin America, Argentina and Venezuela began to attract larger numbers of migrants from neighboring countries. Argentina recorded some 590,000 persons born in other Latin America countries—especially Paraguay, Chile, and Bolivia—in 1970. In Venezuela some 230,000 foreign-born were recorded in 1971. Colombia was the birth place of just over three-fourths of all Latin American migrants into Venezuela.

An important factor in the changing global pattern of international migration during this third phase was economic growth in northern and western Europe, which generated a rising demand for labor. In addition to expanding opportunities for employment for resident citizens (a greater number of whom might otherwise have emigrated), increasing numbers of migrants were attracted from outside Europe. For the decade of the 1960s the net migration balance for Europe as a whole was nearly zero, but gross flows were substantial. For the first half of the 1970s, Europe as a whole had a net inflow of just over 900,000.

The leading countries of immigration were West Ger-

TABLE 1. *Proportion of immigrants whose previous residence was in Europe*

Country	1960–1964	1965–1969	1970–1974
Canada	0.74	0.68	0.43
United States	0.39	0.33	0.24
Australia	0.74	0.72	0.63
New Zealand	0.51	0.48	0.43

Source of data: United Nations, 1979.

many and France, with net inflows over the decade and a half of 3.5 and 2.7 million, respectively. However, almost all of the other countries of northern and western Europe also experienced large net inflows. Switzerland received 335,000, Belgium 220,000, Sweden 210,000, the Netherlands 200,000, Austria 105,000. In all of northern and western Europe, only Finland, Ireland, and the United Kingdom had net outflows during this period, and Finland had a small positive balance for 1970–1974 while the rate of emigration from Ireland declined very substantially in the later years. Net emigration from the United Kingdom amounted to just over 200,000 for the whole period.

A very substantial proportion of the migrants to northern and western Europe came from southern Europe. In all, there was a net outflow of some 4.8 million during the 1960s and early 70s. Portugal contributed 1.1 million to the stream, Yugoslavia just over 1 million, Spain 875,000, Italy 835,000, and Greece 350,000. The demographic impact of the outflow was especially heavy for Portugal, whose total population in 1960 was 8.8 million and which experienced an absolute decline in numbers in the early 1970s.

The large-scale movement from southern to northern and western Europe was clearly a factor in the decline of emigration from that region to North and South America. Nevertheless, it was not at all sufficient to meet the demand for migrant labor in northern and western Europe. In West Germany, for example, 60 percent of the migrants who entered during the first half of the 1960s were from either Italy, Greece, or Spain. A decade later, these three countries were the origin of about 13 percent, having been replaced by Yugoslavia and then Turkey as the chief source countries. France similarly at first depended heavily on Italy and then on Spain as suppliers of migrant workers. Later, in addition to some 950,000 French nationals returned from Algeria around the time of independence (1962), France began to draw more extensively on Portugal, Morocco, Tunisia, and Turkey. Other net receiving countries had similar experience.

It is important to note that for many of both sending and receiving countries involved in the flows to northern and western Europe (and to the Middle East as mentioned later), there was a growing tendency to view the migration as a temporary expedient rather than as a permanent resettlement in another country. The expectation was that each individual migrant and, perforce, the stocks of migrants, would eventually return to his or her country of origin, after the demand for labor had become better matched to the domestic supply of workers. Hence, comparatively little importance was attached to assimilation of migrants into the host societies. While this view was not fully adopted in all countries—France and the

United Kingdom tended more to consider immigration as involving permanent resettlement—it had wide acceptance everywhere and was the official position of many countries.

The experience of the United Kingdom differed from that of the rest of northern and western Europe not only in its persistent net outflow, but also in the regions of origin and destination of its migrants. Immigration from the countries of the Caribbean region was very substantially reduced through restrictions imposed in 1962. During the later sixties and early seventies the predominant pattern was for the United Kingdom to have a net inflow from certain countries of the New Commonwealth (India and the English-speaking countries of Africa) and Pakistan and a somewhat larger net outflow to the countries of the Old Commonwealth (Australia, Canada, and New Zealand), plus smaller streams to South Africa and the United States.

Labor migration was the leading form of international movement in Asia during this period. As already indicated, Turkey became a major supplier of labor to western Europe, nearly 1.2 million emigrants, with the largest number (900,000) going to West Germany.

By about 1970, the stock of migrant workers was beginning to grow in the Arab countries of West Asia. While data for this region are markedly uneven in quality, it appears that more than 1 million were employed, chiefly in the oil-producing countries. Most were drawn from nearby countries: Yemen Arab Republic (North Yemen), the People's Democratic Republic of Yemen (South Yemen), Jordan, Syria, and Egypt. These flows had strong demographic impact because, apart from Saudi Arabia, the native populations were small in comparison with the numbers of immigrants. For example, by 1970 more than half of the resident population of Kuwait had been born elsewhere.

Of course, not all international migration in Asia was viewed as the temporary moves of workers. There was a net flow of about 160,000 from Sri Lanka, chiefly Indian Tamils returning to India. Israel continued to receive a flow of immigrants, with comparatively large numbers in the early 1960s followed by smaller numbers for the period 1965–1974. In all, Israel received about 520,000 immigrants during 1960–1974.

In Africa, too, labor migration grew in importance. Movement from the Maghreb (Algeria, Morocco, and Tunisia) to France has already been noted. Algeria itself is reported to have received substantial numbers of migrants from neighboring countries. Some 110,000 had already arrived by 1966. The Libyan Arab Jamahiriya was estimated to have had some 70,000 foreign workers in 1970, mostly from Egypt and Tunisia, and the number rose to just under 200,000 by 1974. Approximately 85

percent of the migrant workers were from other Arab countries while another 12 percent were from Europe and North America.

In West Africa, the coastal countries have traditionally attracted migrant workers from the landlocked countries of the Sahel. Upper Volta has been a major exporter of labor to the Ivory Coast and Ghana. In addition, there has been substantial movement between countries along the coast by small-scale traders as well as workers. In 1969, Ghana, in response to internal economic strains, expelled all undocumented migrants. An estimated 200,000 to 500,000 left within a period of six months. In the census of 1970, however, some 560,000 foreign nationals were enumerated in Ghana. In the Ivory Coast, immigration has been permitted with little restriction. As of 1975, the country reported some 1.4 million persons of foreign stock, more than 20 percent of the total population. Senegal is also a major country of destination with some 355,000 foreign nationals in its population.

In South Africa, employment of migrant labor was a highly organized practice of long standing, as mentioned earlier. By 1970 the country had just less than 500,000 foreign Africans, nearly all of them migrant workers. Their numbers continued to rise through 1973, when there were nearly 340,000 foreign African workers in the gold mines alone. From early 1974, the flow of migrant workers from Malawi, one of the major source countries, was temporarily halted by the Malawian government. Further in 1974, political independence in Mozambique led to sharply reduced migration from that country as well. Although migration from Malawi was subsequently authorized once again, South Africa has followed a policy aimed at reducing its dependence on immigrant labor. By 1977, the number had declined to 360,000.

Zimbabwe (formerly Rhodesia) reported a foreign-born population of some 365,000 in 1969, but the numbers declined substantially thereafter.

One component of the migration flows from poorer to richer countries for purposes of employment had an impact far beyond its demographic size. Along with the movement of large numbers of workers with comparatively limited skills there was the small but significant flow of highly trained persons, the "brain drain." Conceptual and measurement problems abound, but a plausible estimate of the total net number of such trained migrants from developing to developed countries during the time when it flourished most fully, 1960 to 1975, reaching a peak in the early 1970s, was between 300,000 and 400,000. The countries that received the largest numbers were the United States, with approximately 120,000, the United Kingdom with 84,000, and Canada with 82,000. Migrants came from all developing regions but chiefly from Asia. The great importance attached to these comparatively small flows derives from the heavy costs of education borne in large part by the countries of origin and in the loss of needed skills.

Another important international flow, in part associated with the growing importance of labor migration during this period, was the apparent increase in undocumented migration, which was normally viewed as illegal at least in the country of immigration. Such migration flows by their very nature are difficult to estimate. It is conjectured, however, that there are some 3.5 to 6 million undocumented immigrants in the United States, that some 10 percent of all migrant workers in Europe are in an irregular or undocumented status, that such workers number over 500,000 in Venezuela, and that they are numerous in the countries of net immigration of North Africa and the Middle East. Control of undocumented migrants has become a public policy issue of serious concern in most of the receiving countries.

During the years 1960–1974, refugee and repatriation flows continued to break out from time to time. Leading instances included the movement of perhaps some 10 million from Bangladesh to India in 1971, where the migrants remained for about a year before returning to their country of origin. The formal separation of Pakistan and Bangladesh involved an interchange of some 241,000 persons. During the first half of the 1970s, more than 500,000 refugees were reported in the Indochina region. Near the end of the period, Portugal received an estimated 540,000 repatriates from Angola, Mozambique, and other former colonial territories. Finally, the Office of the United Nations High Commissioner for Refugees estimated about 1.15 million refugees outside their home country in Africa in 1975. The largest single group was 460,000 Angolans in Zaire.

The Later 1970s. Changing economic conditions led, around 1974, at the start of the fourth phase, to a marked change in the pattern of flows of international migration. Economic stringency in European and other urban industrial countries halted the increase in their stocks of migrant workers. Flows into the Middle Eastern and other petroleum-exporting countries continued to increase in importance, however. By the end of 1975, the most recent date for which comparatively reliable data are available, about 2 million migrant workers were estimated to be in the oil-exporting countries of the Middle East and North Africa. Thus, the numbers probably doubled during the preceding five years. All available evidence indicates that the growth has continued until the present, although possibly at a somewhat diminished rate. According to estimates prepared by the World Bank, in 1975 there were some 768,000 migrant workers in Saudi Arabia, 295,000 in Libya, 245,000 in the United Arab Emirates, 211,000 in Kuwait, 182,000 in Iran,

67,000 in Oman, 61,000 in Qatar, 41,000 in Algeria, and 10,000 in Iraq. Migrant workers made up very substantial proportions of the labor force in all but a few of these countries (notably, Algeria, Iran, and Iraq).

Large proportions of migrant workers have continued to come from other countries within the region, but there is also a growing dependence on workers recruited from farther away. In particular, increasing numbers have come from countries of South and East Asia. Indeed, in some net labor-exporting countries such as Jordan, the supply of workers available for emigration appears to have been exhausted and labor shortages have had to be met by migrant workers from other countries of net emigration.

Migration of such size and rapidly growing stocks cannot but have profound social and economic consequences. Unfortunately, the events are still so recent that it is difficult to obtain a very full picture of all of the processes involved. One thing that is clear is that the large flows of population are also generating large new flows of remittances. For example, in 1977 Egypt reported an inflow of $1.4 billion, Jordan $425 million, Pakistan $1.1 billion, the Yemen Arab Republic $1.0 billion. India reported $750 million for 1976. Moreover, the remittance flows have been growing very rapidly. In Egypt, Pakistan, and the Yemen Arab Republic, the flows approximately doubled from 1975 to 1976 and then doubled again from 1976 to 1977 (at current prices). For India, the flow tripled from 1974 to 1976. In general, the rapid development of migrant worker flows and their consequences in the region sharply reflected the other profound social and economic changes taking place associated with the sharp rise in oil prices.

The pattern of flows of migrant workers and members of their families were rather different in Europe. As Table 2 indicates, among the leading countries of immigration, the foreign population substantially increased in one, the Netherlands, and moderately increased in several others. While the stocks continue to be substantial, changes reflect less the effects of entry of new migrant workers and more the results of family reunification and natural increase. To a considerable degree, this fourth phase might

be characterized as a time of relative stabilization in international migration for Europe, following the preceding decade and a half when stocks and flows were building up steadily. During the second half of the 1970s, flows out of the leading countries of net immigration tended to decline from higher levels around 1975 and by the late 1970s were generally comparatively close to the flows in. Thus in most of these countries the average length of residence of immigrants tended to rise.

The United Kingdom continued to experience a net outflow during the fourth phase, but in 1978 and the first half of 1979 the balance approached zero. To a large extent this is a result of declines in the numbers of emigrants to the countries of the Old Commonwealth and South Africa.

Among the traditional leading countries of net emigration, Greece and Italy experienced moderate net inflows from 1975 onward: many were returnees from northern and western Europe. Portugal and Spain continued to experience emigration. Spain had a net outflow of 157,000 from 1975–1978. Turkey has continued to have net emigration, about 44,000 in 1978, with increasing numbers going to North Africa and the Middle East. For Yugoslavia, it appears that net migration has reached almost zero in recent years, with a small net return of workers offset by a small outward movement of dependents of workers previously established abroad.

Remittances to countries of emigration in Europe remained substantial. There was a downward trend for Spain and Turkey during the later 1970s. In both, the total annual remittances dropped below $1 billion a year from peaks reached in 1973. On the other hand, for Greece, Italy, Portugal, and Yugoslavia, remittances continued to grow. In 1978, Yugoslavia received $2.9 billion and Portugal $1.7 billion.

Among the non-European developed countries, Canada had declining net immigration from 1974–1975, when the figure reached 133,000, to 1978–1979, when it fell to 30,000. The decline mostly reflected lower levels of immigration authorized by the government in response to economic difficulties and comparatively high unemployment. By 1978, the majority of immigrants were admitted to achieve family reunification. Canada agreed to accept some 50,000 Southeast Asian refugees during 1979 and 1980.

In Australia, the numbers of net permanent and long-term migrants rose during the later seventies. For the financial year 1977/78, net long-term and settler immigration was 56,000. The proportions of immigrants from Europe continued to diminish during this period; by 1977/78, two-fifths of all the migrants had lived in Europe previous to their move.

The United States continued to receive moderately

TABLE 2. *Total foreign population in selected European countries of immigration (thousands)*

Country	1974	1976	1978
Belgium	805	852	877
France	—	2,700	—
Netherlands	315	376	435
Sweden	401	418	424
Switzerland	1,064	959	898
West Germany	4,127	3,948	3,981

Source of data: SOPEMI annual reports.

increasing numbers of immigrants. From 1974 through 1976 about 400,000 immigrants were admitted per year. For the year ending 30 September 1977, the number rose by some 15 percent to 462,000. As with Australia, a progressively smaller proportion of all migrants came from Europe. By 1977, 16 percent of the migrants admitted reported their previous permanent residence as Europe.

During this most recent phase to early 1980, there were a series of large-scale refugee flows. It has been estimated that in Southeast Asia, more than a million persons had fled their country, by boat as well as overland. Thailand received over 325,000 refugees from Kampuchea, Laos, and Vietnam, some 81,000 of whom were subsequently resettled elsewhere. China received 235,000 refugees and displaced persons from Vietnam. At the same time Vietnam experienced an inflow of 150,000 persons from Kampuchea, many of whom were subsequently repatriated. The United States accepted about 130,000 refugees from this region, and a substantial proportion of the 146,000 refugees established in France were also from here. Others found refuge in Australia, Hong Kong, and Malaysia. Elsewhere in Asia, some 710,000 refugees from Afghanistan entered Pakistan during late 1979 and early 1980.

The largest numbers of refugees were in Africa. More than 1 million refugees from Ethiopia were estimated to be in Somalia. The Sudan had a reported 500,000 refugees from Ethiopia and other neighboring countries. Altogether, more than 3 million refugees were estimated to be in Africa as of early 1980. In North America, the United States received a renewed flow from Cuba, estimated to be more than 100,000 in early 1980, along with a continuing influx from Haiti.

Donald F. Heisel

See also IMMIGRATION POLICY; LABOR FORCE; REFUGEES.

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INTERNATIONAL PLANNED PARENTHOOD FEDERATION

The International Planned Parenthood Federation (IPPF) is an independent world body that unites national family planning associates in one hundred countries. It has provided the voluntary leadership of the family planning movement for the past thirty years.

IPPF was founded at an international conference in Bombay in 1952 by the family planning associations of eight countries—the Netherlands, Hong Kong, India, Singapore, Sweden, the United Kingdom, the United States, and West Germany. Policies are laid down by an internationally representative Central Council, whose members are leaders of their own national family planning movements. They are elected by six regional councils (Africa; East and Southeast Asia and Oceania; Europe; Indian Ocean; Middle East and North Africa; and Western Hemisphere). The international office of the secretariat is located in London.

IPPF provides financial and technical assistance to family planning associations in developing countries, promotes the transfer of knowledge and experience among associations, and articulates the interests of the family planning movement at the global level. It fosters

the establishment of new associations and assists many small local groups to develop into national organizations. For the past few years it has operated with an annual international budget of about $50 million, most of which is distributed in grants to national family planning associations in developing countries. Associations in developed countries participate as members but rely on local support for funding. Representatives of all associations meet in a members' assembly every three years.

Today IPPF is the second largest nongovernmental organization in the world, after the Red Cross, in terms of the global spread of its activities and the volume and scope of its operations. It is the leading nongovernmental organization engaged in population and family planning activities. Its base of local organizations enables it to make contributions that cannot be achieved through international, intergovernmental machinery. The policies of the federation reflect the wide diversity of its membership, in both culture and local conditions.

IPPF is, however, a professional organization and an international authority on the provision of family planning education and service. Manuals and handbooks for doctors and other health workers include a *Family Planning Handbook for Doctors* and separate booklets on each method of fertility control. Publications for opinion leaders and decision makers include *People,* a quarterly development magazine, and *Earthwatch,* a quarterly report on environmental stresses in the developing world. *Open File,* an informal bulletin issued twice monthly, keeps members and supporters in touch with one another and with current policies and achievements. Occasional publications have included *Law and Planned Parenthood,* a handbook for family planning associations, and *The Human Problem of Abortion,* a review of medico-legal issues and options for family planning associations in different social and legal situations. All major titles are published in English, French, and Spanish.

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For information on the work of family planning associations, see FAMILY PLANNING PROGRAMS.

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INTERNATIONAL POPULATION ASSISTANCE

International assistance for activities in the field of population has a history that is brief but spectacular. As recently as fifteen years ago, there was little consensus among governments as to the need for assistance to the Third World except in the fields of demography and statistics. The forces opposing assistance to such activities as family planning and population policy on religious, cultural, or political grounds were still generally dominant. Within many developed countries the promotion of family planning was still, to a large extent, seen as the exclusive concern of voluntary endeavors, supported by private philanthropy. Today, technical cooperation and financial assistance for a wide spectrum of population activities in developing countries are fully recognized as the legitimate concern of, and a high priority for, governments and the international community.

Although a clear-cut and generally agreed-upon definition of the term "population activities" is not available, it clearly includes much more than demography or delivery of family planning services. Population activities covered by international assistance have been broadly classified by the United Nations organizations concerned into the following major subject areas: (1) basic population data, (2) population dynamics, (3) population policy formulation, implementation, and evaluation, (4) family planning, (5) biomedical research, and (6) communication and education. These areas involve a wide spectrum of data collection, training, research, communication, and operational activities.

In the early 1950s, the United Nations began to assist developing countries with census taking, training in demography, and studies on the relationships between population trends and social and economic factors. It also supported some action-oriented research activities. In 1952, two nongovernmental agencies concerned with assistance to population were established, the International Planned Parenthood Federation (IPPF) and the Population Council. The Ford and Rockefeller foundations also began to assist population-related activities. Together these four nongovernmental agencies were the main sources of assistance until the late 1960s when governmental resources became available on a large scale.

In 1958 Sweden became the first government to give assistance to a developing country for family planning. This was in support of an experimental program in Sri Lanka, and it was followed by assistance to the government of Pakistan in 1961. The United Kingdom initiated a bilateral population assistance program on a modest scale in 1964. The U.S. government began to include

population activities in its development assistance in 1965. In the early 1970s a number of governments followed this lead, including those of Canada, Denmark, the Federal Republic of Germany (West Germany), Japan, the Netherlands, and Norway.

The barriers that had handicapped the United Nations system in responding directly to the needs of developing countries for assistance in the fields of population, particularly in family planning, began to be lifted after the mid-1960s. A consensus was reached in the General Assembly in late 1966 concerning the provision of population assistance, upon request, in the areas of training, research, information, and advisory services. In response, the following year, the United Nations Secretary-General established a Trust Fund for Population Activities, later renamed the United Nations Fund for Population Activities (UNFPA), which rapidly grew into a major source of international population assistance in terms of financial resources as well as program development. In the meantime, UNICEF, the International Labour Organisation (ILO), the World Health Organization (WHO), and other United Nations specialized agencies broadened their mandates to include those aspects of population and family planning falling within their areas of competence. In 1968, the World Bank (officially known as the International Bank for Reconstruction and Development, IBRD) and the International Development Association (IDA) began to take into consideration the needs of developing countries for assistance to family planning programs and related activities and made the bank's first loan in this area to Jamaica in 1970.

One of the most important events in the history of international population assistance occurred in 1974 when the third World Population Conference was held in Bucharest. A World Population Plan of Action was adopted at the conference by consensus of 135 states, which *inter alia* called upon developed and other countries to increase their assistance to developing countries: "In view of the magnitude of the problems and consequent national requirements for funds . . . considerable expansion of international assistance in the population field is required for the proper implementation of this Plan of Action" (United Nations, 1975, p. 25).

Recent Trends and Amounts. Total international assistance for population activities amounted to only about $2 million in 1960 and $18 million in 1965, but it increased rapidly to $125 million in 1970 and to an estimated net amount, excluding double counting, of around $450 million in 1979 (see Table 1). Differences in defining population activities and difficulties in identifying population components in multipurpose or integrated development programs make it necessary to exer-

TABLE 1. *Trends in development of population assistance,*[1] *1961–1979*

Year	Total official assistance[2]	Population assistance[3]	Population assistance as percentage of total assistance
1979	26,057.5	455	1.7
1978	22,068.4	394	1.8
1977	18,912.8	349	1.8
1976	17,902.8	304	1.7
1975	18,584.3	281	1.5
1974	14,074.9	254	1.8
1973	10,253.1	211	2.1
1972	7,986.6	186	2.3
1971	7,612.2	169	2.2
1970	6,786.5	125	1.8
1969	6,453.0	86	1.3
1968	6,316.2	58	0.9
1967	6,535.7	30	0.5
1966	5,983.7	34	0.6
1965	5,894.8	18	0.3
1964	5,952.0	16	0.3
1963	5,772.4	11	0.2
1962	5,437.8	5	0.1
1961	5,196.7	6	0.1

[1] Dollar amounts in millions of U.S. dollars.
[2] Excluding export credits, private investment and other commercial transfers.
[3] Net totals excluding double counting due to transfers between donors. Grants by voluntary organizations are not included for the years 1961–1969. In 1970, these grants amounted to $0.9 million.
Sources of data: Organisation for Economic Co-operation and Development reports, government reports, and annual reports of development assistance agencies and organizations.

cise some caution in the interpretation of international statistics on population assistance.

This dramatic increase in population assistance is a clear indication of a growing commitment by governments and international organizations to tackle the urgent population problems of the developing world. The annual increases have been uneven, as Table 1 shows, with the largest jumps in 1979 and 1974. The 1974 rise could be interpreted as a response to the spirit of the World Population Year and the conference, but it is more likely a result of the devaluation of the U.S. dollar, which automatically increased the U.S. dollar equivalent of the amounts pledged by many donors in their own currency.

In the following years the average rate of growth in resources fell well below the level reached earlier in the 1970s. The average annual increase was only 13 percent in the years 1975–1977, as compared with 17 percent on the average in the years 1970–1974. In view of worldwide inflationary trends and the devaluation of the U.S. dollar, the growth in international population assistance has, to a great extent if not entirely, been offset by a

decline in purchasing power. Measured in constant U.S. dollars, the annual increase was for some time only around 2 percent, and from 1974 to 1975 there was no net increase at all. A sharp increase took place from 1975 to 1976 (9.6 percent in constant dollars). In 1977, the level of assistance remained about the same as in 1976, while there was a 10.4 percent increase for 1977–1978.

The magnitude of population assistance has not kept pace with total official development assistance. In the early 1970s slightly more than 2 percent of development assistance went to the field of population, but in 1974 and later years this fell consistently below 2 percent. In 1979, population assistance was only about 1.7 percent of development assistance.

The dominant position of the United States in the donor community has recently been considerably reduced. Before 1974, it provided three quarters or more of government contributions to population assistance and well over half of funds from all sources. In 1979, the total contributions from all other governments exceeded that of the United States.

Sources of Population Assistance. Although more than eighty governments have, at one time or another, contributed to international population assistance, the major shares come from fewer than a dozen countries. The largest contributor, the United States, spent around $182 million on population assistance in 1979, or 3.9 percent of its total development assistance (see Tables 2 and 3). Around one-fifth of this amount was channeled through private and voluntary international organizations based in the United States; nearly one-quarter went to UNFPA and IPPF; about one-fifth was for grants to universities and other governmental and nongovernmental institutions in the United States for research and training related to population issues of developing coun-

tries; and the remainder, more than a third, provided direct bilateral support to population and family planning projects in developing countries.

Sweden and Norway are the two largest donor governments after the United States. In 1979, the total Swedish financial contribution reached a level of around $48 million, amounting to about 5 percent of its total development assistance. Norway, which has more than tripled its population assistance since 1974, contributing just more than $40 million in 1979, which represented 9.4 percent of the total Norwegian development assistance program, the highest proportion of any donor country. (The Norwegian law on development assistance stipulates that 10 percent of all assistance should be for population.) Denmark also gave comparatively high priority to population assistance with contributions in 1979 of more than $9 million or around 2 percent of its total assistance program. Other major contributors were West Germany, with about $35 million in 1979; Japan and the Netherlands with more than $25 and $13 million, respectively; Canada and the United Kingdom with almost $13 and $20 million, respectively; but in all these countries, population assistance constituted less than or around 1 percent of total official development assistance (see Table 3).

A number of donors provide bilateral population assistance, but in only three countries is the population component of the total bilateral governmental assistance program of major significance: in Norway, Sweden, and the United States, where it constituted about 11, 5, and 4.7 percent, respectively.

Around two-thirds of total population assistance provided by governments is channeled through multilateral organizations. About one-tenth of governments' population assistance is on the average spent in institutions in the donor countries themselves. A number of govern-

TABLE 2. *Population assistance by major donor governments, 1973–1979 (in US$ thousands)*

Governments	1973	1974	1975	1976	1977	1978	1979
Australia	579	639	1,587	967	1,345	3,021	3,138
Belgium	75	837	476	934	2,179	2,252	1,810
Canada	4,159	5,498	7,183	8,989	9,719	12,063	12,800
Denmark	2,035	4,784	3,548	4,978	4,445	7,722	9,282
Finland	1,033	2,587	2,026	1,578	1,745	498	538
Japan	2,812	5,293	7,971	9,000	11,800	15,743	25,098
Netherlands	3,718	5,785	6,695	8,954	9,649	12,083	13,794
New Zealand	40	580	880	607	573	627	623
Norway	8,600	10,800	18,500	27,400	30,000	39,962	40,252
Sweden	17,123	21,468	26,169	28,743	31,417	42,339	47,605
Switzerland	189	190	200	242	500	1,149	1,506
United Kingdom	3,861	3,032	6,450	6,983	10,866	14,062	19,917
United States	115,106	110,146	106,036	119,027	145,367	177,596	182,358
West Germany	4,392	5,770	13,400	8,739	14,434	17,002	35,255

Sources of data: Organisation for Economic Co-operation and Development reports, government reports, and annual reports of development assistance agencies and organizations.

TABLE 3. *Government assistance for population activities as percentage of total official development assistance in major donor countries, 1973–1979*

Country	1973	1974	1975	1976	1977	1978	1979
Australia	0.2%	0.1%	0.3%	0.3%	0.3%	0.5%	0.5%
Belgium	0.0	0.3	0.1	0.3	0.6	0.4	0.3
Canada	0.8	0.8	0.8	1.0	1.0	1.1	1.2
Denmark	1.5	2.8	1.7	2.3	1.7	2.0	2.1
Finland	3.7	6.8	4.2	3.1	3.6	0.9	0.6
Japan	0.3	0.5	0.7	0.8	0.8	0.7	1.0
Netherlands	1.2	1.3	1.1	1.2	1.1	1.1	1.0
New Zealand	0.1	1.5	1.3	1.1	1.1	1.1	1.0
Norway	9.9	8.2	10.1	12.6	10.2	11.3	9.4
Sweden	6.2	5.3	4.6	4.7	4.0	5.4	5.0
Switzerland	0.3	0.3	0.2	0.2	0.4	0.7	0.7
United Kingdom	0.6	0.4	0.7	0.8	1.0	1.0	1.0
United States	3.9	3.0	2.5	2.7	3.1	3.1	3.9
West Germany	0.4	0.4	0.8	0.5	0.8	0.7	1.1

Sources of data: Organisation for Economic Co-operation and Development reports, government reports, and annual reports of development assistance agencies and organizations.

ments utilize multilateral channels for most of their support of population activities: Belgium, Canada, Denmark, Japan, New Zealand, Norway, and West Germany. The Netherlands has phased out all bilateral population programs and concentrates its resources entirely on multilateral aid.

Multilateral population programs have grown markedly. Until the mid-1960s, the role of the organizations within the United Nations system was restricted, not merely by limited mandates in the population fields and lack of funds but also because few governments had yet formulated national population policies or foreign aid policies on population. Most of the resources available for population activities undertaken by the United Nations organizations (excluding the UNFPA, whose resources come entirely from voluntary government contributions) are provided by governments as voluntary extrabudgetary contributions; only about one-sixth is provided by assessed contributions to their regular budgets from member states.

Before the third World Population Conference, the UNFPA had already emerged as the largest multilateral source of population assistance. Since 1974 the Fund has continued to grow rapidly. Today, it is the largest source of direct assistance for population activities in developing countries.

A number of nongovernmental organizations have played an important pioneering role in the support of population activities. The four largest in this regard are IPPF, the Population Council, and the Ford and Rockefeller foundations. A number of other smaller private organizations also contribute. Some of them function exclusively in the population field; others support population activities within a broad range of purposes and programs. All these organizations provide a channel for private financial contributions, although many also draw, to some extent, on governmental or multilateral funds, and some rely on the contributions of volunteers and part-time workers. In addition, various professional organizations have become increasingly active in assisting special target groups mainly through education, information, and advisory services.

Mass organizations, such as trade unions, cooperatives, youth and women's organizations, and other key institutional forces with international responsibilities, are also beginning to support the development of population policies and programs, although the primary focus of their activities may not be on population issues.

Furthermore, a number of universities and other educational institutions, mostly American but some European, conduct training programs specifically oriented toward the needs of developing countries, and many support or carry out research as well.

Types and Areas of Assistance. By 1980, 121 developing countries, or nearly all, had received population assistance. Most of this number had received assistance from the UNFPA. About 47 developing countries, or nearly 40 percent, received assistance from bilateral donors as well. The largest donor government limited its bilateral population programs to around 22 countries. The IPPF provided support for national family planning associations or programs in about 85 developing countries.

Almost all donors make their contributions to population assistance in grants, but a few governments (Canada, Denmark, Finland, the United States, and West Germany) also make loans available. Intergovernmental and nongovernmental organizations all provide grants

except the World Bank, which gives only loans or credit. All donors make contributions in cash, but some also provide grants in kind, mainly equipment and contraceptive supplies (Australia, Denmark, Finland, Japan, Sweden, the United States, and West Germany).

In 1979, some 70 percent of the total resources in population assistance supported family planning programs including biomedical research in human reproduction and contraceptive development. Around 11 percent supported the implementation of population policies other than family planning, while data collection and research and training in population dynamics each received just over 6 percent of the total. The formulation of population policies, communication and education activities, and multisector activities received about 3, 4, and 9 percent respectively. Around 26 percent, or $118 million, supported activities at the interregional or global level, while some 7 percent, or around $32 million, was devoted to programs implemented at the regional level. The major part (55 percent) of population assistance in 1979 supported programs carried out at the national level.

A comparison of the assistance provided by the three largest donors illustrated notable differences in program emphasis in recent years. The United States spent more than 75 percent of its resources in the support of family planning programs, while the comparable figure for Sweden was about 50 percent and for the UNFPA slightly less. On the other hand, about 19 percent of UNFPA resources supported basic data collection, while the comparable figure for the United States was only 9 percent and for Sweden, negligible. Both the United States and the UNFPA devoted around 10 percent of their population assistance to population dynamics. Biomedical research, including contraceptive development, received more than 40 percent of Sweden's population assistance, about 5 percent of the United States', and less than 1 percent of the UNFPA's. From a geographical point of view, the United States spent around 67 percent of its resources on interregional and global projects, while for Sweden the share was just under 50 percent and for the UNFPA almost 24 percent. As for assistance to activities at the national level, all three donors spent the largest shares in Asia and the Pacific; this is particularly true of Sweden and the United States, while the UNFPA had a more even distribution across regions.

There are important differences between the support provided by the various donors to the different regions. UNFPA, adhering to the principle of universality, had in 1979 the most even distribution among regions with 38 percent for Asia and the Pacific, 16 percent for Latin America, 15 percent for Africa, and 10 percent for the Middle East and Mediterranean. (These percentages do not add up to 100 because the balance supported interre-

gional and global activities as well as program secretarial services.) Other intergovernmental organizations gave more than half of their funds to projects in Asia and 20 percent for Latin America, but only small percentages to other regions. The United States also made the largest contributions to projects in Asia but the amount is difficult to estimate because grants made through various intermediaries are not easily broken down on a regional basis. Other governments contributed heavily to supporting projects in the Asian region by devoting 89 percent of their funds to them. The IPPF and other nongovernmental organizations (NGO's) provided only 20 percent of their support to projects in this region, while Latin America's share was higher, namely 29 and 21 percent for IPPF and other NGO's respectively.

Regional differences in the amount of assistance provided to the various types of population activities are significant and reflect to a large extent different population problems, policies, and needs. In 1979, 85 percent of all population assistance provided to countries in Asia was devoted to family planning and only small amounts within the range of 2–4 percent went to each of the other sectors. Almost as large a share, namely 81 percent of population assistance in the Latin American region, supported family planning programs and no more than 3–5 percent each for any of the other sectors. In the Middle East and Mediterranean region about two-thirds or 66 percent of the assistance supported family planning activities but a part of the some 12 percent for multisectoral activities also included some support of family planning; the next largest sector in that region was population data collection followed by 6 percent for population dynamics. Among the developing regions, family planning programs received the smallest share of population assistance in Africa but it still amounted to 58 percent of the total; population data collection was the second most important sector in Africa receiving 18 percent, followed by 8 percent for population dynamics, 6 percent for education and communication, and 5 percent for population policies.

The largest amount of assistance in 1979 was given to Bangladesh, India, and Indonesia, in total $105 million or 39 percent of total population assistance at the country level. Assistance in Thailand, the Philippines, and Colombia was within the range of $10 to $19 million, in all $44 million or 17 percent. Six countries received assistance within the range of $5–$9 million and three countries $3–$4 million. All the remaining 113 developing countries received in total $101 million in population assistance—38 percent or about the same as the amount devoted to the three Asian countries receiving the largest support (see Table 4).

The amount of population assistance received by

TABLE 4. *Population assistance, by regions and countries, 1979*

Level of assistance (in US$ millions)	Regions			
	Africa	Asia	Latin America	Middle East and Mediterranean
Over $20		Bangladesh ($44) India ($37) Indonesia ($24)		
$10–$19		Thailand ($18)	Colombia ($11)	
$5–$9	Kenya ($7.5)	South Korea ($8.1) Vietnam ($5.4)	Brazil ($9.7)	Egypt ($6.6)
$3–$4		Nepal ($3.4) Pakistan ($3.1)		Tunisia ($4.9)
Under $3	38 countries (total $25)	29 countries (total $26)	30 countries (total $37)	16 countries (total $13)

Sources of data: Organisation for Economic Co-operation and Development reports, government reports, and annual reports of development assistance agencies and organizations.

countries varied greatly according to their size, level of income, and government policies on population. The average amount of assistance per capita was $1.00 for countries with fewer than one million inhabitants; it declined inversely with size of population and amounted to only $0.12 for countries with 10 million or more. The largest amount of assistance per capita, $0.63, was provided to countries with a gross national product (GNP) per capita between $500 and $1,000, while the poorest countries with less than $250 in GNP per capita received only $0.16 and the most well-to-do developing countries with GNP per capita of $2,000 and over received $0.13. Countries with clear policies to reduce fertility received on the average $0.33 per capita in population assistance, countries without a policy $0.21 per capita, and those with a policy aiming at increasing fertility $0.11 per capita.

Need and Impact. It is a difficult, if not an impossible, task to estimate future needs for international population assistance. Much depends upon the criteria to be applied with regard to the types of population activities that are required, the extent to which support from external sources is needed, the availability of local resources, and the absorptive capacity of the developing countries.

The UNFPA has attempted to estimate the costs of developing comprehensive population programs to meet various targets or goals: to provide information and services on family planning for the entire population of a developing country; to conduct a complete population census in all countries at least every ten years; to establish vital statistics registration systems with a coverage of at least 90 percent; to provide population education in and out of schools; to train personnel required for population programs; and to support research required for planning and implementing effective programs, including opera-

tional research and development of improved contraceptive techniques.

An approximate total annual cost for all relevant population activities is estimated at $1.50 per capita, or $2,900 million (1976 prices), for the developing world as a whole. The provision of family planning and maternal and child health services according to established minimum requirements accounts for over half of this sum, or an estimated $0.84 per capita.

Accurate estimates cannot be made of the need for population programs, and the estimates provided here may not fully recognize certain concomitant needs in the economic and social fields. Nevertheless, it seems fairly clear that the estimated total of about $400 million available for population assistance from international sources amounts to a small proportion, probably only around 10 percent, of total estimated needs for external and internal resources for population activities.

Moreover, in financial terms, international assistance defrays only a small portion of the actual costs of the population activities now undertaken in the developing world. However, the role and significance of international assistance go far beyond its often comparatively modest financial inputs. It constitutes, in many instances, an essential element in promoting national efforts and in enlisting local resources. In many instances, the activities supported would probably not have taken place at all without the interest and contributions of donor governments and agencies. Very often, international assistance provides the important spark needed to overcome reluctance at the local level to expend the necessary financial, human, and material resources for worthwhile activities. Sometimes the will and the necessary local sources may be there, but crucial inputs of equipment and supplies cannot be obtained because of foreign exchange difficul-

ties, which international assistance can solve. The African Census Programme is a case in point, under which a number of developing countries are involved for the first time in taking a population census.

At the same time, the role of international assistance should not be exaggerated to imply that without it major results could not be accomplished. China is an excellent example, where the effective delivery of family planning services at all levels, measures dealing with internal population distribution problems, and contraceptive research were undertaken successfully without any assistance from abroad. The first and so far only population assistance to China, at a level of $50 million over five years, was provided by the UNFPA in 1980 to support the 1982 population census, and to strengthen the national family planning program. Still, the majority of developing countries need and want assistance to expedite the process of dealing with their population problems.

From the limited data available, it appears that more and more developing countries are shouldering increasing shares of the costs of their population programs. For example, in 1971 the government of Costa Rica contributed only about 13 percent of the costs of the national population program; by 1975 its share had risen to almost 40 percent. The share of the government's contribution to population projects in Mauritius rose from 31 to 64 percent over the period 1972–1976. In Nepal, the share of local government resources in population rose from 25 to 79 percent between 1971 and 1975. In 1973, the Thai government contributed 16 percent of the costs of its population programs while in 1977 its share had risen to around 34 percent. The Tunisian government more than doubled its share for population programs in the early 1970s, increasing it from 13 to 34 percent between 1971 and 1976. Such examples imply that outside assistance played a significant stimulating role.

Probably one of the most significant accomplishments of population assistance is the contribution it has made to promoting awareness of population problems and issues, their implications, and the need for policies and programs to deal with them. It may not be possible, in general, to demonstrate definite effects upon population trends, and in any event, results cannot be expected in the short span of a few years. Support provided for the training of personnel, for research and evaluation, for institution building, and for related education and communication activities often has important multiplier effects and long-term benefits that are difficult to measure in quantitative terms.

Future Priorities. Greater attention is being devoted to setting priorities in assistance to population programs. Increasing awareness of the impact of population factors on development with adoption of population policies by more and more governments has led to rapid growth in the demand from developing countries for such assistance and an increasing shortage of available funds. Furthermore, the World Population Plan of Action and other international development strategies have led many donors to review and reassess their development cooperation policies, with particular regard to population.

Reviews have been undertaken by many of the donors, particularly Canada, Sweden, the United Kingdom, the United States, the UNFPA, the World Bank, and the IPPF, often resulting in new strategies or policies for population assistance. Various concepts have emerged or been refined for setting priorities to govern the allocation of resources. Most donors apply more than one criterion in setting priorities. The UNFPA has developed a system for setting priorities based on objective economic and demographic data that reflect need.

The following résumé of criteria for setting priorities is not intended to cover all donors completely; it reflects, rather, new strategies for population assistance resulting from recent reviews, revision, or reaffirmation of policies.

Priority countries. Some donors, such as Australia, Canada, Denmark, Japan, New Zealand, Sweden, and the United States, tend to concentrate their resources in, or give special attention to, the needs of certain countries. In several bilateral programs, the political situation of the recipient countries or special geographical, historical, cultural, or trade considerations play an important role.

Several donors, including the UNFPA, Canada, and the United Kingdom, are particularly interested in assisting the poorest of the developing countries based upon estimated per capita income; other donors like New Zealand and the United Kingdom consider the extent to which recipients are seriously affected by balance-of-payments problems.

Sometimes demographic criteria are taken into account in identifying countries with the most urgent need for population programs. Canada considers birth rate, death rate, infant mortality, and current and future potential population growth. The United States concentrates on countries with large populations contributing most to world population growth and where prospects for reducing fertility are best. The UNFPA uses rates of population growth, fertility, infant mortality, and agricultural population density. The World Bank takes into account population size, growth rate, population density, the government's policy commitment to reduce fertility, and prospective demographic impact.

Priority objectives. Most donors, namely Finland, Japan, Norway, Sweden, the United Kingdom, the United States, West Germany, the UNFPA, the ILO, the FAO, WHO, the World Bank, the Ford Foundation, and

the Population Council are increasingly supporting population activities as an integral part of other aspects of development such as rural development, family health, social welfare, and the participation of women. The UNFPA and the Population Council limit their support mainly to population components in such programs.

Several donors, as for example, the United States, UNICEF, the World Bank, and the IPPF, give priority attention to promoting activities at the local level through community or family based programs. Special attention is given by the UNFPA and the ILO to assisting population activities for the benefit of poverty-stricken and other disadvantaged population groups.

Attempts are being made by the United States, the UNFPA, UNICEF, the ILO, and WHO to determine recipient countries' basic needs in population and related fields.

Priority areas of assistance. Most donors of population assistance continue to give high priority to support for family planning activities designed to attain fertility reduction, health, social welfare, or other socioeconomic development objectives. Contraceptive supplies are provided by a number of donors including Japan, Sweden, the United States, the UNFPA, and the IPPF. Financial or technical assistance for abortion and sterilization programs is provided by Sweden, the United States (sterilization only), the UNFPA, the World Bank, WHO, the IPPF, and a few other nongovernmental organizations. Injectable steroid contraceptives are available only from a few donors such as the United Kingdom, the UNFPA, WHO, and the Population Council.

Future Prospects. It is, of course, difficult to make predictions of the future resources for international population assistance. Very much depends upon the economic outlook of the major donors and the prospects for overall development assistance. Several donors have reached, or will soon reach, the overall goal for development assistance in the Second Development Decade of 1 percent of gross national product, and their population assistance may not increase substantially beyond the equivalent of increases in their national income.

Some of the major donors have reviewed and revised their policies recently to broaden their approach to population issues. Many donors continue to stress fertility control as the major objective of their population assistance, although the World Population Plan of Action stresses other areas as well. Problems of urbanization and spatial distribution, according to a United Nations inquiry, are particular concerns of most governments, but very limited assistance is being provided in these areas. Attention given to biomedical research, including contraceptive development, has not discernibly increased, despite the stress on it in the World Population Plan of Action. In view of the current state of the world economy and the

high rates of inflation experienced by many donors, it does not appear likely, in the immediate future, that significant increases in resources for population assistance will be forthcoming.

Donor governments and organizations have become more concerned with the views, needs, and policies of recipient countries. A considerable part of international population assistance, however, continues to support research, training, and other activities located in the donor countries themselves. Some critics argue that all donors should give more attention to building up the technological and human resource infrastructure in developing countries, in some instances on a subregional or regional basis, and that they should make more use of local expertise and production facilities in the recipient countries rather than send advisers, equipment, and supplies from the industrialized world. The emphasis here is on building self-reliance in the developing countries.

At the moment, international population assistance finds itself at a crossroads. Developing countries now have more trained personnel and better data on population trends and issues, and more of them have established population policies. Consequently, the need for and interest in, as well as the absorptive capacity for, population assistance in recipient countries have substantially increased. This increase is generating a rapidly growing demand not only for population assistance itself, but also for a greater say regarding the sources and uses of such assistance.

A call for a substantial real increase in resources for international population assistance is coming not only from various recipient countries but also from the international community as a whole. Several important international meetings and strategies have recently urged that population assistance be increased substantially, such as the International Development Strategy for the 1980s adopted by the United Nations General Assembly in December 1980, the Independent Commission on International Development Issues chaired by W. Brandt, the Global 2000 Report to the President of the United States, the World Bank's *1980 World Development Report,* and the International Conference on Family Planning in the 1980s held in April 1981. The International Conference of Parliamentarians on Population and Development held in 1979 urged that population assistance to developing countries be doubled in five years to an annual level of $1 billion by 1984.

The response from donor governments to these urgent calls has still to come. Many of the donors are facing economic and financial difficulties, making it difficult for them to live up to the goals established internationally. At the annual meeting of UNFPA's governing body held in June 1981, the major donor governments insisted that the Fund should plan its program activities over the com-

ing four years on the assumption that the annual increase in resources would be no more than 10 percent, although current plans and perceived needs called for considerably larger increases. This may be indicative of the outlook for international population assistance as seen by major government donors for the near future.

The problem, however, is not merely one of seeking financial means to bridge the widening gap between the demand for and supply of international population assistance. Equally important, especially in the present situation of resource constraints, is to take vigorous steps to improve program delivery through better planning, more efficient implementation, built-in evaluation, and other means of increasing efficiency and effectiveness. It is as important to resolve the problems through dialogues between donors and recipients, on an *ad hoc* basis. The donor community desires better planning and coordination in order to maximize the impact of its inputs, and it is setting priorities to regulate the direction, areas, and modes of assistance.

Apart from striving to ensure a continuous growth in the resources available for population assistance, the donor community should focus on channeling assistance to help developing countries increase their self-reliance in the formulation as well as the implementation of population policies. It is not only a matter of stepping up technical cooperation and providing financial assistance. More concerted action is needed toward developing global strategies to assist developing countries in dealing with their own major population problems, rather than merely effecting a transfer of funds between donors and recipients.

Halvor Gille

See also INTERNATIONAL PLANNED PARENTHOOD FEDERATION; UNITED NATIONS; UNITED NATIONS FUND FOR POPULATION ACTIVITIES; WORLD FERTILITY SURVEY.

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INTERNATIONAL UNION FOR THE SCIENTIFIC STUDY OF POPULATION

The International Union for the Scientific Study of Population (IUSSP) is the only worldwide and independent association whose members are dedicated to the study of population problems. It was founded in 1928 as a federation of national communities to further the science of demography by fostering relations between persons engaged in the study of population in all countries, and by stimulating interest in demographic matters among governments, national and international organizations, scientific bodies, and the general public. The Union was reconstituted in 1947 as an association of individual scholars. Its members have a variety of scientific and professional backgrounds but work chiefly on the study of population problems or are active in other ways in the population field. By 1979 there were about 1,400 members, from 105 countries; an increasing proportion are scholars and professionals from the developing countries.

The Union's Council, composed of eleven persons, administers the affairs of the organization and organizes its scientific activities, subject to the directives of the General Assembly constituted by all IUSSP members. The statutory aims are furthered through the operation of scientific committees. These committees are created upon the recommendation of the Scientific Activities Coordinating Committee (SACC) and are composed of a limited number of members selected according to their scientific ability, but taking into consideration, as far as feasible, the criterion of geographical representation. To ensure international coordination, representatives of the United Nations, either from the Population Division or the Statistical Office or from the United Nations Fund for Population Activities (UNFPA), also serve on committees. The activities of the scientific committees are carried out through meetings, the organization of specialized seminars and conferences, and the preparation of scientific publications. In 1980 the scientific committees were as follows: Comparative Analysis of Fertility, Analysis of Family Planning Programmes, Studies on Population Policies in Developing Countries, Interaction between Demographic Variables and Income Distribution, Factors Affecting Mortality and the Length of Life, and Historical Demography. In addition, working groups are set up for exploratory work on new or less-studied areas; they included National Bibliographies, Methodology for the Study of International Migration, Economics of International Migration, and the Teaching of Demography. Some of the work of the scientific committees and working groups is reported in a series of IUSSP Papers.

The Union organizes general conferences every four years for all members and other scholars. It also holds various specialized conferences and seminars to discuss specific aspects of population studies and issues reports of proceedings.

The IUSSP collaborates with the International Statistical Institute on the World Fertility Survey, and it has consultative status with the Economic and Social Council of the United Nations and with the United Nations Educational, Scientific, and Cultural Organization (UNESCO). It derives financial support from grants from governments, foundations, UNFPA, UNESCO, and other international agencies, in addition to dues paid by its individual members. Its offices are located in Liège, Belgium.

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ISRAEL

See NORTH AFRICA AND SOUTHWEST ASIA, *article on* ISRAEL.

JK

JAPAN

Japan presents a unique demographic picture in that it is, as of 1980, the only Asian country to have completed the demographic transition from high to low fertility and mortality. As compared with Western countries, the transition set in relatively late; but once started, it proceeded rapidly, requiring only some forty years beginning in 1920 for its completion. Along with this demographic change, Japan moved quickly from the status of developing to developed nation.

Location and Description. Japan, off the east coast of Asia, is composed of four main islands. Despite the fact that it ranks seventh in the world in size of population, Japan's total land area is severely limited: approximately 377,700 square kilometers (about 145,800 square miles), somewhat less than the state of California in the United States. Thus, the population density is high; in 1980 it was 314 persons per square kilometer (814 per square mile) as compared to the world average of 31 per square kilometer (80 per square mile). The pressure of population on land is seen to be even more significant when it is remembered that only 19 percent of Japan's total area can be used for cultivation. High population density is not recent; it has been maintained through generations, and in fact, most Japanese commonly perceive their country as being overcrowded.

Prior to World War II, Japan depended heavily on agriculture and fishing for the support of its population. For the past several decades, emphasis has been on the development of industry; the spread of industrialization was particularly rapid during the 1960s. As a result, living standards have improved remarkably. The total gross national product (GNP) for 1979 was US$929 billion (second to that of the United States among free-market economies), and the average per capita income was $6,292. Industrialization has, however, brought about heavy dependence on overseas trade for the procurement of foodstuffs. Only 40 percent of the total consumption of cereals in Japan is produced domestically. Although the production of rice far exceeds consumption, less than 5 percent of other cereals consumed, notably corn, wheat, and soybeans, are domestically produced. Those who favor zero growth or even a negative rate of population growth in Japan in the future predicate their concern on this precarious demand-supply relationship in foodstuffs.

Population Characteristics. As of 1980, the population of Japan was 117 million. Around 1912, it was about 50 million and it reached 100 million in 1967 (see Table 1). The time required for this doubling was fifty-five years, and the annual rate of population growth during this period was, on the average, 1.3 percent, much smaller than rates recorded in other Asian countries in the twentieth century.

The total number of households was 35,977,000 in 1980. The average size of households has continuously declined since 1935, with 3.25 persons in 1980 as compared to about 5 in 1935. A trend toward the nuclear family undoubtedly has contributed to this change.

The total number of married women 15–49 years of

TABLE 1. *Population of Japan and sex ratio, 1920–1980*

Year	Population (in thousands)	Sex ratio (males/females × 100)
1920	55,963	100.4
1930	64,450	101.0
1940	73,114	100.0
1945	72,200	89.0
1950	83,200	96.3
1960	93,419	96.5
1970	103,720	96.4
1975	111,940	96.9
1980	116,916	96.7

Source of data: National census data.

age was 20,345,293 according to the 1975 census (18 percent of the total population). In 1978, the average age at first marriage was 27.6 years for males and 25.1 for females. It has advanced in general since 1950 because of increasing numbers of people involved in higher education and work before marriage.

The total size of the labor force was about 57.1 million in 1980 (61 percent male and 39 percent female). Of both sexes aged 15 years and over, 63.9 percent were in the labor force in 1980. The male labor-force participation rate among older age groups is higher in Japan than in other industrialized countries. Table 2 shows the breakdown of workers by industry. It is anticipated that primary industry will shrink further while tertiary industry will continue to increase.

The dependency ratio (the number of young and old economic dependents per 100 productive-age members of society 15–64 years of age) has shown considerable change as well. In 1920, it was 71.6 (62.6 young and 9.0 old). By 1950, it had fallen to 67.7 (59.4 plus 8.3). Owing to a sharp decline in births following the postwar baby boom, child dependency dropped rapidly so that by 1970, the total dependency ratio was down to 45.2. In more recent years, however, although the child dependency ratio has remained unchanged, the dependency ratio of the aged has been on the increase, reflecting an overall aging trend. In 1980, the total dependency ratio was 48.4 (35.0 young plus 13.4 old), slightly above the 1970 level, and it is expected to rise gradually to 52.5 in the year 2000.

The first nationwide census was taken in 1920. Complete full-scale censuses have been taken every ten years since then; more recently, abridged censuses have been inserted between complete ones. Reliability of census data in Japan is extremely high.

Table 3 gives the age structure of the population by three major age groups. It shows that the proportion of the aged has steadily risen and that it is estimated to double during the thirty-year period 1970–2000. Now that the problems associated with rapid population growth are over, it is widely maintained that aging of the population is a matter of paramount importance.

Figure 1 shows the trends in fertility and mortality beginning in 1920. In Japan, since out-migrants and in-migrants are about equal in number, natural increase approximates total population increase.

Both birth and death rates have declined substantially since around 1920. During World War II, particularly 1944–1946, the birth rate sharply declined and the death rate leaped. The natural increase became a temporary decrease. A postwar baby boom took place in 1947–1949. After this, however, the birth rate decreased precipitously.

During the period 1955–1970, the rate of natural increase remained relatively constant at a level of 1 percent a year as a consequence of stable birth and death rates. A very conspicuous dip in the birth rate in 1966 was the result of an ancient superstition that girls born in the year of the *hino-e-uma* (fiery horse) have unlucky prospects. Since 1973, however, the rate of natural increase has shrunk because of a steady decline in the birth rate, and is now well below 1 percent a year. Table 4 compares this decline with more refined indexes. The fertility of Japanese couples has continued to be below replacement level since 1974.

TABLE 3. *Population by major age groups in Japan, 1920–1980 and 2000 (estimation)*

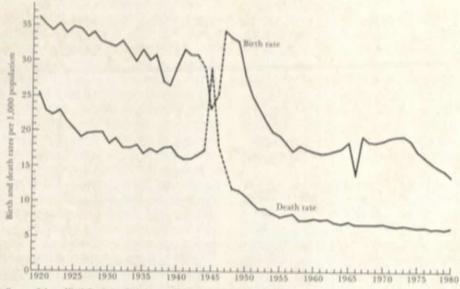| Year	0–14 years	15–64 years	65 and over
1920	36.5%	58.3%	5.3%
1930	36.6	58.7	4.8
1940	36.1	59.2	4.7
1947	35.3	59.9	4.8
1960	30.0	64.2	5.7
1970	23.9	69.0	7.1
1980	23.5	67.4	9.0
2000	20.2	65.6	14.3

Source of data: National census data.

TABLE 2. *Distribution of the economically active population in Japan, 1940–1980*

	1940	1950	1960	1970	1975	1980
Primary industry	44.3%	48.3%	32.6%	19.4%	13.9%	10.9%
Secondary industry	26.0	21.9	29.2	34.0	34.1	33.5
Tertiary industry	29.0	29.7	38.2	46.6	51.7	55.4

Source of data: National census data.

FIGURE 1. *Birth and death rates in Japan, 1920–1980*

Japan has an unusually long series of surveys of knowledge, attitude, and practice (KAP surveys) with regard to family planning. This series has been undertaken biennially since 1950 by Mainichi, one of the major newspaper agencies.

In 1935, diseases resulting from bacterial infection were the most important causes of death, accounting for 43 percent of all deaths. Since then, the significance of infection has decreased remarkably; in 1977, bacterial diseases accounted for only 7 percent of deaths. As in other developed nations, degenerative diseases have become a major concern (69 percent of all deaths in 1977). Maternal and childhood diseases have declined in proportion, while accidents and suicides have increased.

In 1920, less than 20 percent of the population was urban, but by 1975, the urban proportion had risen to 76

percent. In huge metropolitan areas such as Tokyo or Osaka, suburbs have come to show a higher rate of population increase than the oversaturated center of the city.

The majority of the Japanese are followers of either Buddhism or Shintoism. By and large, however, religious practice remains rather nominal; it does not exert a significant influence over the people's daily behavior.

Policy and Action. The first episode to bring the population problem to national attention was the rice riot of 1918. On that occasion, a large number of underprivileged people protested against high prices and criticized government rice policy. As the population problem was gradually brought to the public attention, a dispute over Japan's population growth took place among social scientists. In 1927, the government established an official commission to investigate population-food relationships. Three years later, the commission was abolished, but it had set a precedent for discussing population matters in official circles.

Since then, factors other than food, such as employment, supply and consumption of raw materials, and the preservation of the environment, have entered into the consideration of population problems, although food still remains a central issue.

During the late 1930s and 1940s, a political atmosphere advocating pronatalist policies inhibited any discussion of population control. Voluntary birth control programs that had existed previously were all suspended.

Development of population policies. Immediately after World War II, with shortages of almost all goods, the

TABLE 4. *Fertility indexes for Japan, 1973–1980*

Year	Crude birth rate	Total fertility rate	Net reproduction rate
1973	19.4	2.14	1.01
1974	18.6	2.05	0.97
1975	17.1	1.91	0.91
1976	16.3	1.85	0.88
1977	15.5	1.80	0.86
1978	14.9	1.79	0.86
1979	14.2	1.77	0.84
1980	13.6	1.74	0.83

Japanese suffered tremendously in their daily lives. They soon recognized the necessity of birth limitation in order that an already lowered standard of living should not fall further. A feeling that the nation was overpopulated became widespread and efforts to control births developed spontaneously at the grass-roots level. Much publicity was given to population matters in newspapers and magazines. On a few occasions, objections to birth control were voiced by Communist and Roman Catholic leaders. While administrators in the government did not enforce explicit population control policies as such, people proceeded on their own to regulate fertility, mainly through induced abortion.

It has been documented that even more than a century ago, induced abortion and infanticide were practiced among the peasants to check the growth of family size at times of economic crisis. The postwar upsurge of birth control was thus a recurrence of traditional behavior rather than an entirely new phenomenon. Nevertheless, the fact that birth control was initiated after the war primarily as a voluntary effort by the people themselves is noteworthy. Many individuals still remembered the relatively high living standards they had enjoyed before the war; faced with the reality of miserably lowered levels as a result of the war and its devastation, people went to great lengths to recover their prosperity. Thus, as a voluntary movement, birth control in Japan differs basically from what is occurring in many developing countries where national family planning programs have been initiated by governments striving to create the necessary motivation.

Nonetheless, the involvement of the Japanese government was instrumental in facilitating the process of fertility decline in postwar years. In 1948, the Eugenic Protection Law was passed, containing three major provisions. (1) family planning field-workers were to be trained and deployed; (2) induced abortion was legalized for health reasons (a year later, the law was amended to include economic reasons); and (3) sterilization operations were legalized for health reasons. Before passage of the law, criminal abortions had been on the increase, and it was considered essential from the standpoint of maternal health to provide a channel for legalized, sanitary, safe abortion. The law did not constitute an explicit antinatalist policy. It was presented as a public health measure rather than a demographic one.

No doubt it was expected that decline in fertility might be accelerated by liberalizing induced abortion. Thus, one might well argue that the establishment of such a law was in fact a population policy. In any event, the law did not enforce or encourage induced abortion; it simply permitted it. Recognition of its immediate, potent effect on fertility was kept behind the scenes.

Reactions to demographic changes. The role played by the widespread practice of induced abortion in the curtailment of fertility was significant, particularly in the period 1950–1960. Since then, prevention of pregnancy through contraception gradually has gained ground over abortion, although the total volume of induced abortions is estimated still to be fairly large.

Debates have developed between those advocating the liberal attitudes to abortion shown in the Eugenic Protection Law and those who would return to a more rigid handling of abortion. Both groups have been equally vocal. Those in favor of restrictions base their arguments on moral and religious grounds as well as asserting that abortion is physically harmful. Those against deliberalization maintain that abortion remains a "necessary evil" and that restrictions on abortion necessarily result in a high incidence of criminal clandestine abortions. The government has made no official decision in either direction.

In 1951, alarmed by the sharp increase in induced abortions, members of the Japanese cabinet held an *ad hoc* conference and issued an official statement to the effect that contraception was to be recommended as a far more reasonable method of family limitation than induced abortion and that official programs to promote family planning were to be strengthened. In 1952, the Ministry of Health and Welfare compiled a scheme for a national family planning program. Technical guidance rather than general education in family planning was emphasized. Health centers, midwives, local community organizations, and voluntary workers all were mobilized. Since around 1960, however, the scope, coverage, and content of the national family planning program have changed because of the rapid decline in the national birth rate and the accelerated diminution of family size.

During the 1960s, in discussing family planning, a positive approach, that is, having a few children rather than avoiding having children, was stressed. Birth control for population control gave way to family planning for individual health and well-being. A close tie between family planning and maternal and child health was advocated. Direct government involvement in family planning became weak, and actions at the community level were directed more to sex counseling, marriage guidance, and youth education.

In 1969, the Commission on Population Problems attached to the Ministry of Health and Welfare issued an interim report. Concerned about the prevailing low fertility and reproduction rates, the commission concluded that it was necessary for Japan to restore its fertility slightly in order to maintain a stationary population in the future. The commission did not, however, urge any policies that would increase fertility directly; instead, it recommended the strengthening of social development

programs to lessen the economic, social, and other deterrents to pregnancy, childbirth, and the rearing of children. The report was given wide publicity, but no specific, concrete governmental actions ensued.

Environmental and economic concerns. In the meantime, another population issue, the problem of uneven distribution as a result of large-scale migration to the cities, came to the fore. After a series of discussions within and outside the government, certain measures were taken to promote regional development of industry for purposes of absorbing younger workers into local labor markets. The measures were, by and large, not particularly successful; but since around 1970, internal migration changed its general pattern spontaneously and population increases in giant cities diminished. Medium-sized cities and the outskirts of large metropolitan areas began to accommodate many in-migrants.

The remarkable economic growth of the 1960s came to an end in the 1970s. In this turning point from acceleration to deceleration in the national economy, a number of problems associated with the deterioration of the environment and the precarious supply of natural resources emerged. The so-called oil shock in 1973 was literally a shocking experience to the society. People began to consider possible dangers involved in the endless pursuit of material wealth. It was recognized that certain limits ought to be placed on economic growth, especially in a country like Japan that has neither enough resources nor enough space for its population.

The sense that a richer economic future was not necessarily guaranteed had its repercussion also in the population field. On the occasion of the World Population Conference in 1974, the Commission on Population Problems submitted a recommendation suggesting that it would be preferable for Japan to try to reach a growth rate of zero as soon as possible. The authorities accepted this recommendation, and the Japanese delegation to the conference referred to the need for directing attention to the problem of population increase not only in developing countries but also in developed nations.

The problem of low fertility. The demographic discussion has subsequently changed its focus again. Rapidly falling birth rates in western and northern Europe are taken as showing a possible future path for Japan also, and there has emerged a concern about the low fertility of the Japanese people. This concern stems mainly from the question of who is to support the ever-increasing numbers of the aged. It seemed apparent that public-assistance schemes could not cope with the situation adequately. Caring for the old by the young within the family would be an unavoidable necessity. The question is "Could this be done if the decline in fertility continues or accelerates?"

The Commission on Population Problems was convened once again. The main function assigned to it was an analysis of basic factors relating to fertility decline in recent years. A special subcommittee was established for this purpose and it submitted a report to the commission, which in turn conveyed the report to the Minister of Health and Welfare. After analyzing a number of factors associated with fertility, the report presents a view that it is possible for Japan to see a rise in fertility, if not a substantial one, in the future.

Throughout these developments, one may note that the emphasis in population concern in Japan has, by and large, shifted from numerical growth to composition, structure, and distribution. After an accumulation of experiences, coming generations are expected to be highly aware of the significance of population as a prime determinant of the nation's future.

Activities by private organizations. The Family Planning Federation of Japan is a national voluntary organization representing several constituent bodies. It functions in publicity, education, and the training of family planning professionals. The Japan Family Planning Association is the largest of the federation's constituents; it has been very active in the production of family planning educational materials and also in the delivery of contraceptives to the general public.

In 1968, the Japanese Organization for International Cooperation in Family Planning (JOICFP) was established. Its efforts to provide assistance in family planning were at first entirely for Asian countries, but more recently its activities have been expanded to include some Latin American and African countries. With the growing interest on the part of the government in international aid programs, JOICFP provides a unique channel for both public and private enterprises in population and family planning. Of particular significance has been its innovative idea of promoting family planning through integration with parasite control.

Scholarly Activities. The Population Association of Japan has some three hundred members. It has published a journal since 1952 under different titles: *Archives of the Population Association of Japan*, *Bulletin of the Population Association of Japan*, and subsequently *Journal of Population Studies*. It holds a general meeting once a year; topics presented in the meeting range widely in both formal and substantive demography.

Demography is included in some courses in university departments related to economics or sociology. Population and family planning are often presented as special topics to medical and public health students. However, in many teaching institutions, demography is not quite established as an independent entity.

The Institute of Population Problems attached to the

Ministry of Health and Welfare constitutes a central unit for demographic research in Japan. Usual subjects, such as fertility, mortality, aging, the labor force, migration, nuptiality, and population genetics are all given attention by respective specialists. The Institute of Public Health, also attached to the Ministry of Health and Welfare, contains a small demography unit. Its research has been mainly in the field of family planning, contraception, induced abortion, and sterilization.

<div align="right">Minoru Muramatsu</div>

See also ASIA.

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KNOWLEDGE, ATTITUDE, AND PRACTICE SURVEYS
(KAP SURVEYS)

See FAMILY PLANNING RESEARCH.